

West Eugene Wetlands Mitigation Bank

Annual Report – 2005



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This report was prepared by the Parks and Open Space Division
of the City of Eugene's Public Works Department



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Chapter 1. Introduction

Background

The West Eugene Wetland Mitigation Bank Program operates under an agreement between the Oregon Department of State Lands, Oregon Department of Environmental Quality, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, and the City of Eugene. The Memorandum of Agreement (MOA) establishing the Bank was signed in 1995.

This is the tenth annual report required as a condition of the MOA that established the West Eugene Wetland Mitigation Bank (Bank). This annual report serves two primary purposes:

1. To fulfill the technical reporting requirements identified in the MOA.
2. To provide a broader view of the Bank's operations and accomplishments for a general audience who view the Bank as a model project in Oregon and the United States.

Organization of this report

This report is organized into two main parts with an introduction:

Chapter 1: Introduction. This chapter provides an overview of the mitigation bank program and this annual report.

(1)

(2) **Part 1: Financial and Planning Information**

Chapter 2: Credit and Financial Summary. This chapter describes the financial status of the Bank. Information on credit sales, credit generation, Bank expenditures, and a financial reconciliation are included.

Chapter 3: Capital Improvement Plan. This chapter presents the Bank's proposed future projects, from 2006 through 2008.

Chapter 4: Plant Materials Program. This chapter describes the plant materials procurement activities of the Bank.

Part 2: Site reports

Chapter 5: Introduction to Site Reports. This chapter contains an overview of the information contained in the site reports. It also presents the structure for the reports.

Chapters 6 - 14: Site reports. These chapters include information on individual mitigation bank sites including: background, design goals, management actions from the previous year, and recommended actions for 2006. The monitoring reports are also included.

Appendices:

- A - Monitoring Methods.** This section is a description of the data collection methods employed to obtain data used in the monitoring reports.
- B - Species Lists for all Mitigation Bank Sites.** The species observed on each site are recorded by noting the section of the restoration or enhancement area in which they were found.
- C - Rainfall Graph.** This graph shows monthly rainfall totals for the Eugene Airport during 2004-2005 compared to the mean and standard deviation of monthly rainfall between 1940 and 2005.

A brief overview of wetland regulation and planning

Wetlands are regulated by a combination of Federal, State, and local regulations. At the Federal level, wetlands are regulated by U.S. Army Corps of Engineers under the Clean Water Act and the Rivers and Harbors Act, as well as by the U.S. Natural Resources Conservation Service under the federal Farm Bill. At the State level, wetlands are regulated by the Oregon Department of State Lands under the State Removal-Fill Law. At the local level, wetlands are also regulated by the West Eugene Wetlands Plan, Oregon's first Wetland Conservation Plan. The West Eugene Wetlands Plan (Plan) was originally adopted by the Eugene City Council and the Lane County Board of Commissioners in 1992, and then amended in 2000 and 2002. The Plan is a multiple objectives planning document that provides a vision for wetland protection while accommodating development. The Plan policies call for creation of a mitigation bank to help fund restoration and enhancement. The West Eugene Wetlands Mitigation Bank was created to meet this need.

Mitigation bank program

Why a mitigation bank? The advantage of a mitigation bank is that mitigation actions are planned within the context of the wetland system where the most suitable sites are identified, acquired, and restored in advance of wetland impact. This strategy is preferred to other alternatives that usually result in incremental and ecologically disconnected attempts at mitigation.

Why a public mitigation bank? The advantage of a public mitigation bank is that the functions and values that the wetland resource may provide are accessible to the community. Although use may be restricted, it is not prohibited. The public is able to utilize opportunities for recreation and education. The lands of the West Eugene Wetlands Program comprise the largest component of the open space system within the City's Urban Growth Boundary. Furthermore, the bank is managed by the City, which is held accountable by the community that it represents.

What is the West Eugene Wetland Mitigation Bank? The West Eugene Wetland Mitigation Bank program includes wetland restoration and enhancement on a number of suitable sites and the certification and sale of mitigation credits to applicants required to provide compensation for adverse impacts to wetland resources. Restoration sites are located within a connected system of existing wetlands that are managed by the West Eugene Wetlands Partnership. The Bank orchestrates the process of mitigation by providing compensatory mitigation in advance of approved impacts to wetlands. The Bank is a key instrument envisioned in the Plan to achieve three major objectives: (1) to

lead in the implementation of plans to restore and enhance wetland communities, (2) to provide certified compensatory mitigation credits to businesses and public agencies that seek to impact wetlands located within the Bank's service area, and (3) to provide an alternative to meet mitigation needs in a timely and economic manner

What are credits? A credit is a unit of measure representing the accrual or attainment of wetland functions at a mitigation bank. The unit of measure of function is typically indexed to the number of wetland acres that are restored, created, enhanced, or preserved. A “certified credit” results when the mitigation bank has met or exceeded the performance standards established in the Bank MOA. Once credits are certified, they are available for sale or exchange.

For more information on mitigation banks in Oregon, visit the Oregon Department of State Lands Wetlands Program web site.

Who are the players?

The City of Eugene is the Bank sponsor. Staff from the City of Eugene’s Parks and Open Space Division, Natural Resources Section, manage Bank operations. The Bureau of Land Management (BLM) and The Nature Conservancy (TNC), as partners in the West Eugene Wetlands Program and as a cosigner to the Bank MOA (in the case of the BLM), provide technical assistance to develop monitoring protocols, to design restoration and enhancement projects, to construct Bank projects, and to contribute to the operation and management of the Bank.

State and federal agencies form a committee, the Mitigation Bank Review Team (MBRT), which oversees the Bank’s operations. It is the responsibility of the MBRT to review and approve plans for wetland restoration and enhancement, to monitor Bank operations for compliance, and to provide technical assistance in Bank management when requested. The MBRT consists of representatives of three federal agencies (the U.S. Environmental Protection Agency, the Army Corps of Engineers, and the U.S. Fish & Wildlife Service) and two state agencies (the Oregon Division of State Lands and the Oregon Department of Environmental Quality).

Where can West Eugene Wetland Mitigation Bank projects occur?

Bank mitigation projects take place within the Long Tom River watershed, of which Amazon Creek is a tributary. Figure 1.1 shows the geographic area within which the mitigation bank operates. This area was originally identified on Map 2 of the West Eugene Wetlands Plan as the “Western Amazon Drainage Basin”, and in Appendix C (Map 1) of the MOA that established the Bank.

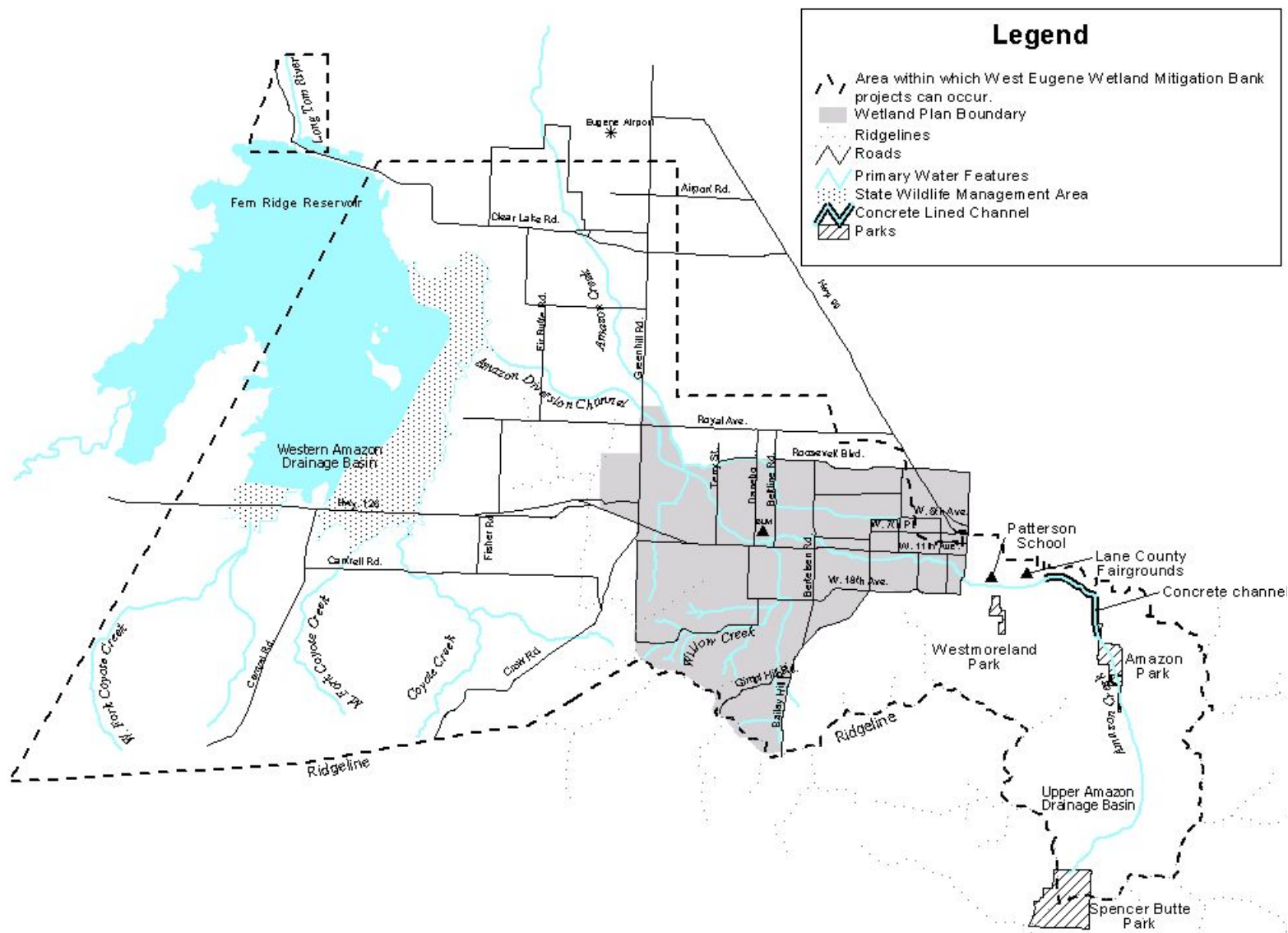


Figure 1.1. Area within which West Eugene Wetland Mitigation Bank projects can occur.

Chapter 2. Credit and Financial Summary

Financial information for the 2005 calendar year is provided in this chapter. Included is:

1. Information regarding mitigation credit sales during 2005.
2. A list of pending bank customers and the number of credits expected in the transactions.
3. A list of annual Bank credit sales from 1994 – 2005.
4. A summary of Bank revenues and expenses.

Credit sales during 2005

At the beginning of the calendar year, the Bank had a credit balance of 7.53 credits. During 2005, the bank had an additional 22.35 credits certified for sale as a result of enhancement and restoration actions undertaken in 2004, leaving a balance of 29.88 credits. The Bank sold a total of 2.02 mitigation credits during 2005 to a combination of private and public organizations, leaving an end-of-year balance of 27.68 credits. Please refer to Table 2.1 below, for a more detailed view of the credits sales.

Table 2.1 Summary of credit sales during 2005.

	Purchase Date	Credits in Transaction	Balance
Credit balance on January 1, 2005			7.53
Credits requested for certification during year		22.35	29.88
Credits sold in 2005			
Home Depot USA Inc. - 7th & Seneca	January 2005	(0.11)	29.77
City of Eugene: Candlelight Park	February 2005	(0.69)	29.08
Arlie & Company - Crescent Village Nodal Development	March 2005	(0.12)	28.96
Bethel School District 52 - Terry Street	June 2005	(0.10)	28.86
City of Eugene: 3rd/4th Connector GJN 3827	June 2005	(0.03)	28.83
City of Eugene: Amazon Park GNJ 3870	June 2005	(0.50)	28.33
City of Eugene: Greenhill Tributary GJN 4182 (Bethel School District)	June 2005	(0.57)	27.76
Spooky Hollow LLC - Summit Glen Subdivision	July 2005	(0.01)	27.75
ODOT Region 2 - Beltline and I-5 Interchange	August 2005	(0.07)	27.68
Subtotal of credits sold in 2005		(2.20)	
Credit balance as of December 31, 2005			27.68

Pending credit sales

The pending sales list is an inclusive list of Bank customers who have indicated that they intend to utilize the Bank as for achieving their mitigation within the Joint Wetland Fill Permit Application. The pending sales list is not a waiting list. Customers are added to the pending sales list upon submittal of a letter of intent to use the Bank. Wetland Fill Permit applicants are encouraged to notify the Bank of their intent to purchase credits from the Bank prior to submitting their application to the regulatory agencies. Once on the pending sales list, the Bank works with the applicant to ensure that the applicant has submitted all required information concerning the impact. In addition, this list is one of the tools used by the Bank to gauge the demand for credits. At the end of 2005, the Bank had two pending requests for a total of 9.41 credits (see Table 2.2).

Table 2.2. Pending credit sales.

	Purchase Date	Credits in Transaction	Balance
Balance forward after approval of credit request			27.68
Pending credits sales			
Hayden Enterprises, Meadow View Park subdivision, Phase 1		(5.50)	
City of Eugene, realignment of Airport Road		(3.91)	
Subtotal of credits pending		(9.41)	
Estimated credit balance if pending credit sales are completed			18.27

Annual Bank credit sales from 1994 - 2005

Since its first credit sale in 1994, the Mitigation Bank has sold a total of 82.02 compensatory mitigation credits. See Table 2.3 for an annual break-down of credit sales.

Table 2.3. Summary of Annual Credit Sales, 1994 – 2005

Calendar Year	Total Credits Sold
1994	7.29
1995	1.50
1996	2.71
1997	15.03
1998	9.66
1999	8.08
2000	5.13
2001	7.40
2002	7.73
2003	3.10
2004	12.19
2005	2.20
Total	82.02

Financial summary

Table 2.4 summarizes the Bank's financial activity during 2005. The Bank started the calendar year with a cash balance of \$783,660.85. Revenue from Credit Sales and other sources of income totaled \$169,395.32. Operations and Maintenance costs totaled \$339,872.23, while Capital Costs totaled \$178,426.90. The end of year cash balance was \$434,757.04 (Table 2.4).

Table 2.4. Financial summary for 2005.

Description of Item	Transaction Amt.	Balance
Cash Balance - January 1, 2005		783,660.85
Revenue		
Credits Sold (2.09) at \$50,000 per credit.	104,500.00	
[Home Depot (.11 credits) were sold in 2005 but cash received in 2004]		
BLM Assistance Agreement Grant.	40,953.83	
Lower Amazon Creek Restoration Project Native Seed and Plant Material.	5,036.49	
Interest Income	18,905.00	
Subtotal of Revenues	169,395.32	
		953,056.17
Operations and Maintenance Costs		
WMB/OM Payroll and misc. operation expenses	335,122.68	
WMB/OM Dnbo Wst: Balboa Phs I	(16.57)	
WMB/OM Dnbo Wst Bvr Rn Phs I	32.35	
WMB/OM Stewart Pond Complex	(12.20)	
WMB/OM Nolan	4,745.97	
Subtotal of Operations and Maintenance Costs	339,872.23	
		613,183.94
Capital Costs		
WMB Unit 2 Lower Amazon	3,404.05	
WMB Dragonfly Bend	56,457.33	
WMB Stewart Pond Remedial	14,095.52	
WMB Oxbow West	6,975.46	
WMB Turtle Swale	2,840.00	
WMB Seed Procurement Program	94,654.54	
Subtotal of Capital Costs	178,426.90	
Cash balance - December 31, 2005		434,757.04

Chapter 3. Capital Improvement Plan

This chapter contains a summary of the projected new mitigation bank projects for 2006 through 2008. The Capital Improvement Program for 2006 – 2008 is outlined in Table 3.1, below.

Table 3.1. Capital Improvement Program for 2006 – 2008

Year	Project Name	Description of Actions ¹	Acres	Credits ²
2006	Coyote Prairie	Develop and submit a Mitigation Improvement Plan (MIP) for the 240 Coyote Prairie site.	--	--
2006	Coyote Prairie, Phase 1	Implement Phase 1 of the Coyote Prairie MIP. This will involve using no-till agricultural site preparation techniques. Plant with high diversity, native Willamette Valley wet prairie and vernal pool seed mixes.	23.00	11.50
2006	Lower Amazon (Meadowlark Prairie), Unit 2	Foster establishment of native grass cover crop. Control spread of any aggressive, non-native species that become established.	52.25	0.00
2007	Coyote Prairie, Phase 2	Implement Phase 2 of the Coyote Prairie MIP. This will involve using no-till agricultural site preparation techniques. Plant with high diversity, native Willamette Valley wet prairie and vernal pool seed mixes.	40.00	20.00
2007	Lower Amazon (Meadowlark Prairie), Unit 2	Foster establishment of native grass cover crop. Control spread of any aggressive, non-native species that become established.	52.25	0.00
2008	Coyote Prairie, Phase 3	Implement Phase 3 of the Coyote Prairie MIP. This will involve using no-till agricultural site preparation techniques. Plant with high diversity, native Willamette Valley wet prairie and vernal pool seed mixes.	40.00	20.00
2008	Lower Amazon (Meadowlark Prairie), Unit 2	Foster establishment of native grass cover crop. Control spread of any aggressive, non-native species that become established.	52.25	0.00

¹ For a full description of the planned actions, refer to the associated MIP

² The number of credits is estimated based on the approved MIP. The final number of certified credits is determined by as-built conditions and the subsequent approval by the DSL and the Corps. Credits are shown as 0.0 when the specific activity (e.g., doing initial site prep) shown in any one year does not actually generate credits.

Chapter 4. Plant Materials Procurement Program

The West Eugene Wetlands Partnership's plant procurement program continues to evolve and improve. The plant procurement program seeks to: (a) ensure the availability of native plant materials for restoration efforts within the West Eugene Wetlands study area, and (b) determine and implement the most ecologically-effective and cost-effective propagation and establishment methods for each species.

The main propagation strategy for most species is via seeds (see Table 4.1). Seeds of most of our native wetland species are not available commercially, particularly seed of local origin that will allow us to maintain genetic integrity of local wetland plant communities. Thus, seed is obtained in two main ways: (a) purchasing seed of local genetic origin from a private or public growers, and (b) hand-collecting from sites within 20 miles of west Eugene.

After undertaking a systematic review of the plant materials program in 2004, we assigned a propagation strategy for each species found within the West Eugene Wetlands within the four main habitats of the area (emergent wetland, vernal pool wetland, wet prairie, upland prairie). Results indicated that the program was relying too much on wild-collected seed and underutilizing the ability of public and private growers to provide large amounts of seed at a lower cost. Starting in 2004, the program began a contract with Heritage Seedlings of Salem, Oregon. Over the past two years, 33 wet prairie and upland prairie species have been put into grow out there. This is in addition to species already in growout with other growers.

With the addition of the Heritage Seedlings contract, the West Eugene Wetlands Partnership currently has seed growout programs with five different growers as well as bulb, plug, and bare-root stock grown by with two additional growers. A summary of the 2005 activities with each grower are summarized below and in Table 4.1.

- Horning Seed Orchard: The Bureau of Land Management's Horning Seed Orchard in Colton, Oregon began growing out some of our species in 2004 for seed production. Horning produced 45 lbs of seed of eight species. By 2006, we hope to transfer production of many of these species to Heritage Seedlings (see below).
- Heritage Seedlings: Heritage Seedlings in Salem, Oregon, began growing out eighteen species for us under contract in 2004. We added an additional 15 species in 2005.
- Stone Nursery: The U.S. Forest Service's J. Herbert Stone Nursery (Stone) in Central Point, Oregon has been growing out small seed quantities for the WEW Partnership since 1996. To date, Stone has attempted to grow approximately 45 species of native plants from the West Eugene Wetlands. Most of these species are no longer grown at Stone. However, during 2005, Stone provided 13 pounds of seed of 2 species.

- **Pacific Northwest Natives (PNN):** PNN in Albany, Oregon has successfully grown more than ten species from the West Eugene area in larger plots, including: *Agrostis exarata*, *Beckmannia syzigachne*, *Bromus carinatus*, *Danthonia californica*, *Deschampsia cespitosa*, *Elymus glaucus*, *Epilobium densiflorum*, *Hordeum brachyantherum*, *Lupinus rivularis*, and *Plagiobothrys figuratus*. During 2005, over 750 pounds of seed were purchased from PNN for wetland mitigations. All seed has gone through the Oregon State seed certification program, including germination and purity testing.
- **Plant Materials Center:** The USDA-NRCS Plant Materials Center (PMC) in Corvallis, Oregon worked with germinating, retaining vigor, and specialized harvest techniques for 35 species of West Eugene plants in 2005. Many of these species germinated successfully, including some that took two years to germinate. Seeds from problematic species were grown out under controlled conditions; the seeds produced by those efforts were returned to the West Eugene Wetlands program. Some of the new species sent to other growers in 2004 and 2005 were previously grown successfully at PMC.
- **Trillium Gardens:** Trillium Gardens, a private nursery in Pleasant Hill, Oregon, grew nearly 18,000 seedlings plugs of 13 species in 2005.
- **Buggy Crazy:** A program was started in 2003 with a private bulb grower, Buggy Crazy (Lebanon, Oregon), to produce bulbs and bare-root stock. Three-year-old bulbs of seven species were planted into restorations this fall.

In addition to these growout programs, we managed one seed collecting crew in 2005. The crew collected seed for restoration sites and for use in the contract growout programs we have with both private and public growers. Over 70 pounds of seed from 42 species of native plants was collected by the combined effort of the crew and West Eugene Wetlands Partnership staff.

Table 4.1. Plant Procurement Program.

Description of current plant procurement strategy for the West Eugene Wetlands Partnership. An “x” in a box indicates that we used that strategy in 2004. * em = emergent, up = upland prairie, vp = emergent, wp = wet prairie.

Species	Habitat*	Hand Collected	Purchased Seed					Plugs, Bare Root, Bulbs	
			Heritage	PMC	Horning	PNN	Stone	Buggy Crazy	Trillium
<i>Achillea millefolium</i>	up		X						X
<i>Agrostis exarata</i>	wp/vp					X			
<i>Allium amplexans</i>	wp/up	X						X	
<i>Asclepias speciosa</i>	wp/up		X						X
<i>Aster hallii</i>	wp/up						X		X
<i>Balsamorhiza deltoidea</i>	up			X					
<i>Beckmannia syzigachne</i>	em					X			
<i>Brodiaea coronaria</i>	wp/up							X	
<i>Brodiaea elegans</i>	wp/up							X	
<i>Bromus carinatus</i>	up	X	X						

Species	Habitat*	Hand Collected	Purchased Seed					Plugs, Bare Root, Bulbs	
			Heritage	PMC	Horning	PNN	Stone	Buggy Crazy	Trillium
<i>Bromus sitchensis</i>	up					X			
<i>Calochortus tolmei</i>	up							X	
<i>Camassia leichtlinii</i> ssp. <i>suksdorfii</i>	up	X						X	
<i>Camassia quamash</i> var. <i>maxima</i>	wp	X						X	
<i>Carex densa</i>	em						X		
<i>Carex feta</i>	vp/wp			X					
<i>Carex lanuginosa</i>	vp			X					
<i>Carex stipata</i>	em	X			X				
<i>Carex tumulicola</i>	up		X	X					
<i>Carex unilateralis</i>	vp/wp	X			X		X		
<i>Carex vesicaria</i>	vp/wp			X					
<i>Castilleja tenuis</i>	wp/up		X						
<i>Cicendia quadrangularis</i>	vp			X					
<i>Clarkia purpurea</i>	up		X						
<i>Collomia grandiflora</i>	wp/up		X		X				
<i>Danthonia californica</i>	wp/up					X			
<i>Deschampsia cespitosa</i>	wp					X			
<i>Deschampsia danthonioides</i>	vp/wp	X	X						
<i>Deschampsia elongata</i>	wp	X		X					
<i>Dicanthelium acuminatum</i>	wp	X			X				X
<i>Dichelostemma congestum</i>	wp							X	
<i>Dodecatheon hendersonii</i>	wp							X	
<i>Dodecatheon pulchellum</i> ssp. <i>macrocarpum</i>	wp	X							
<i>Downingia</i> spp. (<i>elegans</i> and <i>yina</i>)	vp/wp			X					
<i>Eleocharis obtusa</i>	em			X					
<i>Eleocharis palustris</i>	em	X		X					
<i>Elymus glaucus</i>	up					X			
<i>Epilobium densiflorum</i>	wp					X			
<i>Eriophyllum lanatum</i>	wp/up		X				X		
<i>Eryngium petiolatum</i>	vp			X					
<i>Festuca californica</i>	up		X						
<i>Festuca roemerii</i>	up	X	X	X					X
<i>Fragaria virginiana</i>	wp/up							X	
<i>Galium trifidum</i>	wp			X					
<i>Geranium oreganum</i>	up			X				X	
<i>Gilia capitata</i>	wp/up		X						
<i>Glyceria occidentalis</i>	vp/em				X				
<i>Gratiola ebracteata</i>	vp			X					
<i>Grindelia integrifolia</i>	vp/wp		X						
<i>Hordeum brachyantherum</i>	vp					X			
<i>Iris tenax</i>	up							X	
<i>Juncus acuminatus</i>	vp/em	X							
<i>Juncus bolanderi</i>	vp/em				X		X		
<i>Juncus ensifolius</i>	vp	X			X				
<i>Juncus nevadensis</i>	vp/wp			X					

Species	Habitat*	Hand Collected	Purchased Seed					Plugs, Bare Root, Bulbs	
			Heritage	PMC	Horning	PNN	Stone	Buggy Crazy	Trillium
<i>Juncus oxymeris</i>	vp/em	X							
<i>Juncus tenuis</i>	wp/up	X	X						
<i>Koeleria macrantha</i>	up	X							
<i>Lasthenia glaberrima</i>	vp	X		X					
<i>Leersia oryzoides</i>	em	X							
<i>Linanthus bicolor</i>	wp		X		X				
<i>Lomatium nudicaule</i>	wp/up	X	X						
<i>Lotus formosissimus</i>	wp			X					
<i>Lotus unifolius</i> var. <i>unifolius</i>	wp/up		X						
<i>Ludwigia palustris</i>	vp/em			X					
<i>Lupinus affinis</i>	up		X						
<i>Lupinus bicolor</i>	wp	X	X						
<i>Lupinus polyphyllus</i>	wp	X	X						
<i>Lupinus rivularis</i>	wp/up	X	X			X			X
<i>Luzula comosa</i>	wp/up	X	X		X		X		
<i>Madia elegans</i>	wp				X				
<i>Madia glomerata</i>	wp			X					
<i>Madia sativa</i>	wp/up		X						
<i>Microseris laciniata</i>	wp/up	X	X						
<i>Mimulus guttatus</i>	vp/wp				X				
<i>Montia linearis</i>	vp			X					
<i>Myosotis laxa</i>	vp			X					
<i>Myosurus minimus</i>	vp			X					
<i>Navarretia intertexta</i>	vp	X		X					
<i>Nemophila menziesii</i>	up			X					
<i>Orthocarpus bracteosus</i>	wp	X	X						
<i>Perideridia</i> spp. (<i>gairdneri</i> and <i>oregana</i>)	wp/up		X	X					
<i>Phlox gracilis</i>	vp			X					
<i>Plagiobothrys figuratus</i>	vp/wp					X			
<i>Plectritis congesta</i>	wp/up	X	X						
<i>Potentilla gracilis</i>	wp/up	X	X						X
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	wp/up		X						X
<i>Pyrracoma racemosa</i>	wp			X					
<i>Ranunculus occidentalis</i>	wp		X						X
<i>Ranunculus alismafolia</i>	vp	X		X	X				
<i>Ranunculus orthorhynchus</i>	wp	X	X						
<i>Rorippa curvisiliqua</i>	em/vp	X		X					
<i>Rumex salicifolius</i>	up	X			X				X
<i>Saxafraga oregana</i>	wp	X		X				X	
<i>Sidalcea cusickii</i>	wp					X			X
<i>Sidalcea virgata</i>	up		X	X					
<i>Sisyrinchium idahoense</i>	wp/up	X						X	
<i>Triteleia hyacinthina</i>	wp	X						X	
<i>Veronica peregrina</i> var. <i>xalapensis</i>	vp	X		X					
<i>Veronica scutellata</i>	em/vp			X					
<i>Viola praemorsa</i>	up			X					

Species	Habitat*	Hand Collected	Purchased Seed					Plugs, Bare Root, Bulbs	
			Heritage	PMC	Horning	PNN	Stone	Buggy Crazy	Trillium
<i>Wyethia angustifolia</i>	wp/up	X	X				X		X
<i>Zigadenus venenosus</i>	wp/up	X						X	

Chapter 5. Introduction to Site Reports

Monitoring reports have been prepared for all active West Eugene Wetlands Mitigation Bank sites. The reports are found in the following section (Part 2: Chapters 6-16). There are currently ten mitigation sites within the monitoring program. Bank sites are monitored for a period of 5 years or until the site meets mitigation bank success criteria. During the monitoring period, a variety of assessments are made of each site throughout the year.

The monitoring reports are utilized to assess the mitigation's success in achieving the performance criteria and the overall performance of the mitigation. Qualitative assessments are made on a quarterly basis and seek to document site hydrology, non-native vegetative cover, and wildlife use. Quantitative vegetation assessments occur in years 2, 5, and 7 (if applicable). The data is analyzed to determine if the mitigation site is meeting the performance criteria established in the MIP. In addition, both qualitative and quantitative data are used to help guide the maintenance activities recommended for each site. The methods used in the collection of all data are discussed in detail in Appendix A.

The outline of each site report is given below. The reports begin with a description of the site, its history, and management goals. This section also includes a site map. A summary of the site's progress toward meeting mitigation bank performance criteria follows. The current year's management and maintenance actions, along with recommendations for future management actions, are also included. The final section summarizes the data collection and analysis that took place in the current year.

I. Site Name

A. Site Description

1. *Size*
2. *Ownership*
3. *Site Timeline*
4. *Location*
5. *Site History*
6. *Focus of Prescriptions*
7. *Site-Specific Management Goals*
8. *Site Map*

B. 2003 Monitoring Summary

1. *2003 Management Actions*
2. *Management Actions for 2004*

C. Monitoring Results

1. *Hydrology*
 - a) *Methods*
 - b) *Results*
2. *Vegetation*
 - a) *Methods*
 - b) *Results*
3. *Wildlife Utilization*

Chapter 6. Balboa Unit

A. Site Description

1. **Size:** 74.1 acres
2. **Ownership:** BLM, City of Eugene
3. **Site Timeline:**

Table 6.1. Balboa Unit site timeline.

	Section	Year of Construction	Acreage	Monitoring Period
Phase 1	Northern Portion (Atlantic/Pacific)	1998	1 acre	1999-2004
	Southern Portion	1998	7 acres	1999-2003
Phase 2		1999	1.57 acres	2000-2004
Enhancement		1999	10 acres	2000-2005

* For the final report on the southern portion of Phase 1, see the 2003 Annual Report.

4. Location

West side of Danebo Road, adjacent to the north bank of Amazon Creek. TRS, Tax lot #:17-04-33-20 tax lots: 603 and 700

5. Site History

Over the course of the last 60 years this site has been modified to serve as an airfield and a drag racing strip. Prior mitigation prescriptions were executed for the development of Ross Industrial properties located to the north and east along Danebo Ave. These prescriptions removed segments of the former airstrip runway.

6. Focus of Prescriptions

Restoration and enhancement of a large, continuous wetland tract adjacent to Amazon Creek that connects adjacent grasslands and enhances the wildlife corridor. Frontage along Amazon Creek exposes the public to a variety of wetland community types occurring within the west Eugene system. Prescriptions include removal of the remaining runway, removal of fill material, removal of noxious and invasive species, and seeding/planting of native grasses and forbs. In addition, an upland area will be enhanced to serve as a buffer from adjacent industrial land use and a trail system will be developed through the unit

7. Site-Specific Management Goals

1. Restore wet prairie and emergent wetland vegetation to areas proposed for fill removal.
2. Enhance existing wet prairie vegetation by removing invasive woody vegetation and maintaining as prairie through periodic burning and/or mowing on a portion of the wetland area that has moved from wet prairie to scrub-shrub wetland.
3. Restore native wet prairie and emergent wetland conditions by removing fill material to the original hydric soil surface.
4. Enhance habitat conditions for native wildlife species associated with wet prairie and emergent wetland habitats.
5. Maintain upland areas in native vegetation.

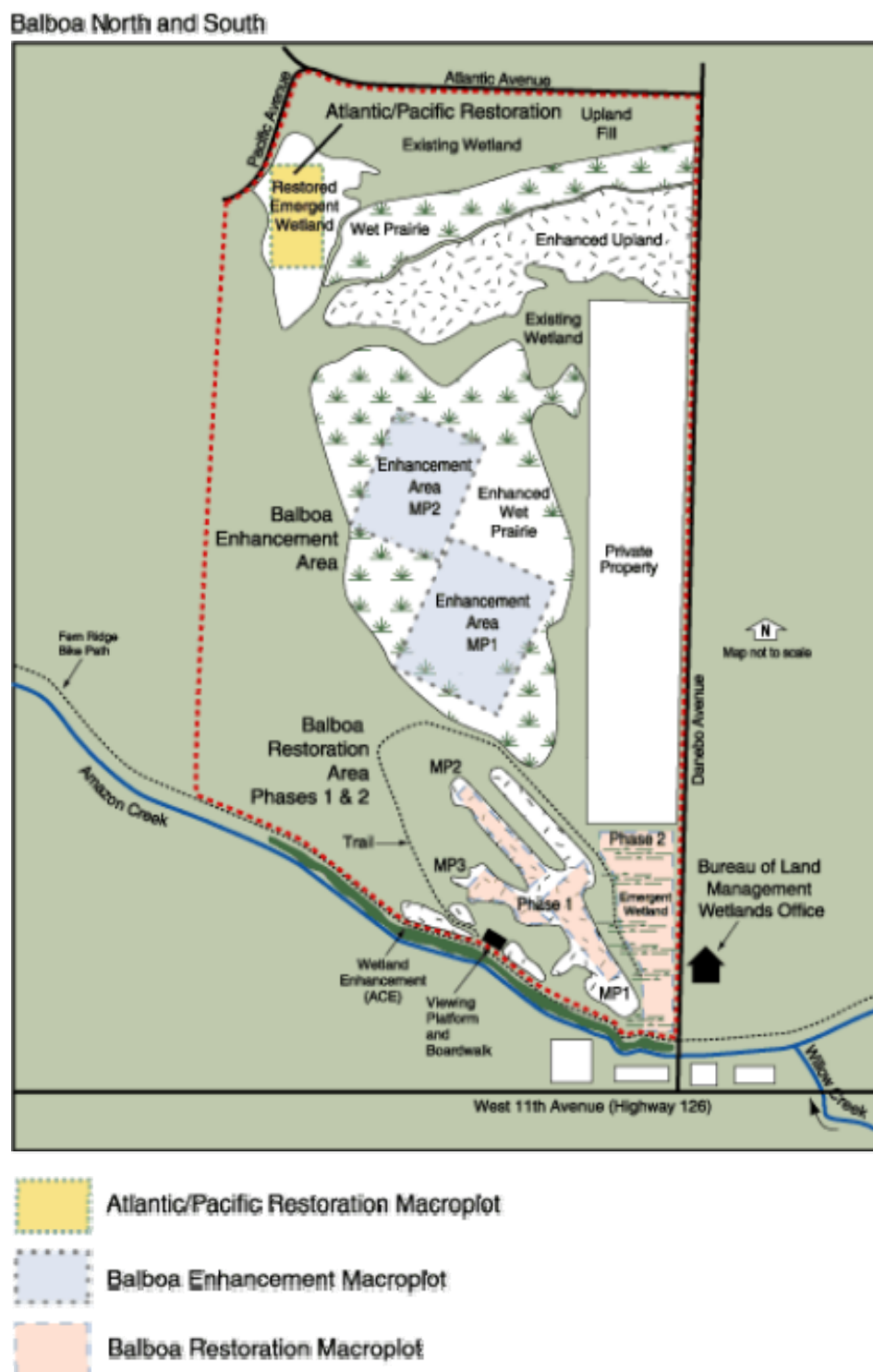


Figure 6.1. Balboa Site Map.

The Enhancement area, Phases 1 and 2 restorations, and the Atlantic/Pacific restoration are labeled with their associated macroplots. Although not labeled as such, the area within the red project line that is shaded green is existing wetland.

B. 2005 Monitoring Summary

In 1999, prior to treatment, the Balboa Unit Enhancement Area had been severely encroached by woody vegetation, mainly Armenian blackberry (*Rubus armeniacus*), Nootka rose (*Rosa nutkana*), native and non-native hawthorn species (*Crataegus* spp.), and Oregon ash (*Fraxinus latifolia*). The Balboa Unit Enhancement goals included the maintenance of wetland vegetation, hydrology, and soils as well as the conversion of the area from a shrub-scrub community back to a wet prairie community by removing encroaching trees and shrubs through hand-clearing, mowing, and prescribed burning. The mitigation project has been successful in meeting its goals. The wet prairie vegetation, wetland hydrology, and wetland soils have been maintained or enhanced. Treatments have also been successful in removing the encroaching trees and shrubs. The plant community has been changed from shrub-scrub to wet prairie (Figure 6.2).

Below, the rare plant monitoring results are presented, followed by a comparison of the post-treatment site conditions against the woody vegetation removal performance criteria.

The rare plant populations in the Balboa Enhancement, with the exception of *Erigeron decumbens* ssp. *decumbens*, appear stable. The populations of both *Horkelia congesta* var. *congesta* and *Aster curtus* increased between 1999 and 2005. The number of *Erigeron decumbens* ssp. *decumbens* crowns has fallen since the beginning of monitoring. Crown numbers decreased after the initial treatment, appeared to stabilize (2000-2004), and then decrease again in 2005 to less than 70% of the original numbers. From 1999 to 2004, the population appears to fluctuate with changes in precipitation. In 2005, a combination of increased vole activity and decreased precipitation appears to have led to the steep decline in the population. From plot observations, these two factors, rather than treatment (because no treatment occurred between 2004 and 2005) caused the population decrease. Of the two factors, vole activity (direct herbivory and soil disturbance) seemed to cause the most damage. The monitoring results for *Erigeron decumbens* ssp. *decumbens* at Balboa are similar to results for many other populations of this species in 2005. Voles damaged populations throughout the Willamette Valley because of their unusually high numbers.

Shrub monitoring occurred in 1999 (pre-treatment) and 2005 (6 years post treatment). The performance standard for shrubs requires a 60% decrease in *total* cover after 5 years. While total shrub cover did not decrease by 60% in either macroplot (56.5% decrease in macroplot 1 and a 28.9% decrease in macroplot 2), the cover of non-native shrubs was reduced by 64% in macroplot 1 and 59% in macroplot 2. Native shrub cover decreased by 4.7% (macroplot 1) and 21.5% (macroplot 2). While the site did not meet the performance standard *per se*, the condition of the site today is drastically different from pre-treatment condition and meets the intent of the original goal. Before treatment, the blackberry mounds were common, dense, and over six feet tall. The shrubs detected in the post-treatment monitoring were less than a foot tall and appeared to have resprouted from persistent root stock, which is very common for the species present. Without the use of herbicides, these species will continue to sprout from root stock. Shrub removal will continue after the completion of the monitoring period through annual mowing and prescribed fire. This will prevent further encroachment, but cannot prevent root sprouting between treatments.

Tree density monitoring also occurred in 1999 (pre-treatment) and 2005 (6 years post treatment). The performance standard for trees requires a 70% decrease in density after 5 years. Results of the tree census showed a 62% decrease in the number trees in the enhancement area. While most trees were removed, Oregon ash (*Fraxinus latifolia*) and hawthorn (*Crataegus* spp.) stumps continue to produce

many suckers. *Fraxinus latifolia* trees in the 1-2 meter category increased from 901 in 1999 to 1827 in 2005. This was undoubtedly due to suckering of previously cut stumps. Therefore, one large tree can be replaced with many small suckers, skewing the data analysis. **If all trees less than a meter tall are removed from the analysis, the number of trees in the enhancement area were reduced by 93%.** Sucker removal will need to continue biennially through mowing or mechanical removal after the completion of the monitoring period. This will prevent further encroachment, but will not prevent root sprouting between treatments.

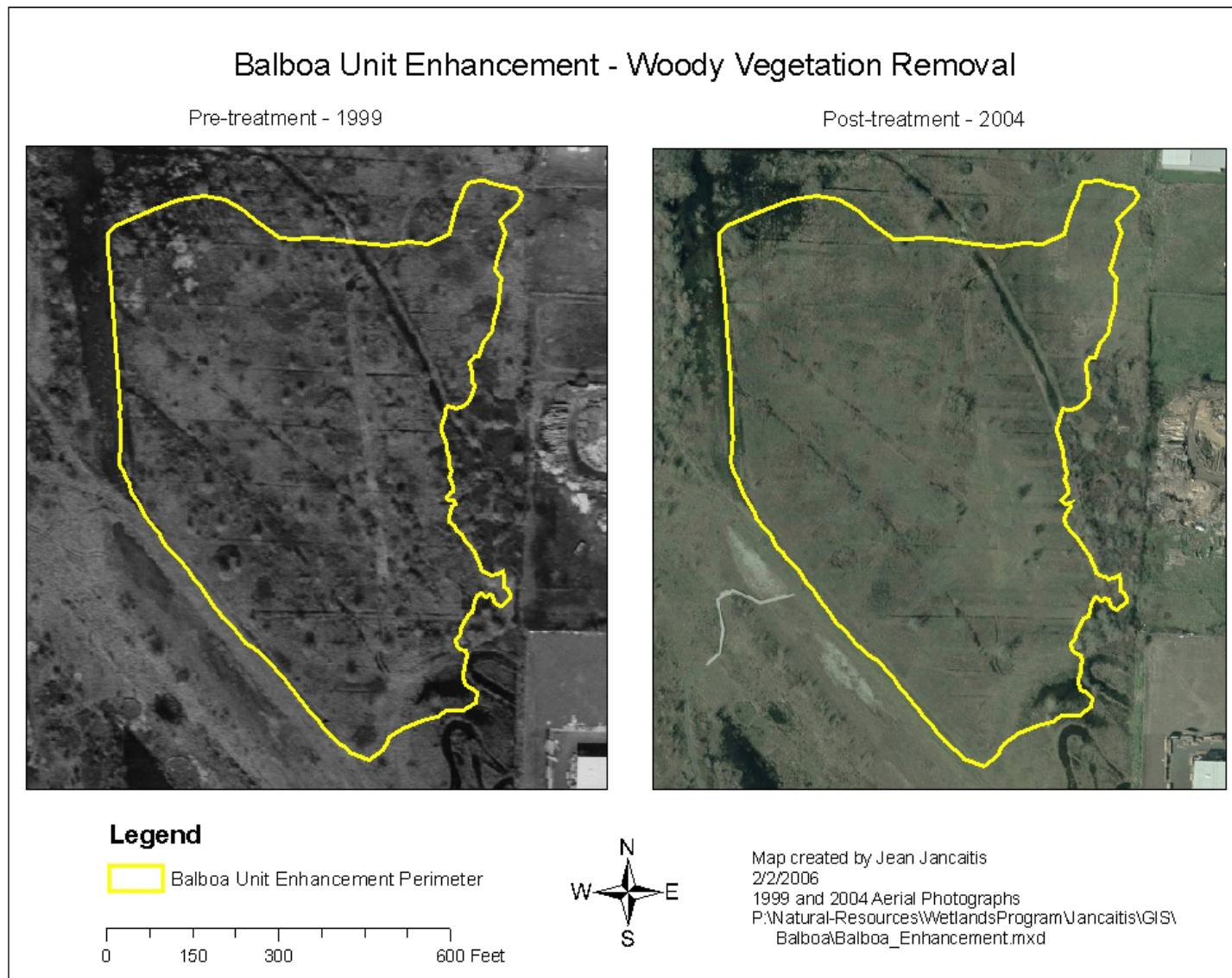


Figure 6.2. Balboa Unit Enhancement – Woody Vegetation Removal.

The 1999 aerial photograph (left) shows the Balboa Unit Enhancement the year prior to the removal of encroaching woody vegetation. The 2004 aerial photograph (right) shows the enhancement area four years into treatment. The area has and continues to be treated with mowing, hand clipping, or prescription burning to reduce the cover of woody vegetation.

1. 2005 Management Actions

1. The whole enhancement area, except the rare plant macroplots 1 and 2, was mowed to reduce tree and shrub cover.
2. Rare plant macroplots 1 and 2 were burned in September. The remaining standing dead woody vegetation was removed from the plots by a hand crew.

2. Management Actions for 2006

2005 was the final year in the monitoring period for Balboa Enhancement. Future management is the responsibility of the BLM. They, in partnership with the City of Eugene, will continue to remove weeds and woody vegetation from the site to improve prairie quality and protect rare plant populations.

Table 6.2. Progress of the Balboa Unit enhancement towards meeting the mitigation goals.

The most recent data for the enhancement is compared to its relevant mitigation goals and standards.

Site Characteristics and MIP Vegetation Standards	Status	
Site status in the monitoring period	Year 6 of 6	
Hydric soils	Present	
Wetland hydrology	Present	
Hydrophytic vegetation	Present	
60% reduction of total shrub cover after 5 years	Macroplot 1	Macroplot 2
total shrub cover reduction	56.5%*	28.9%*
70% reduction of tree density after 5 years	62% total reduction*	

* Please see the 2005 Monitoring Summary (Section B) and Figure 6.2 for additional information.

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil were estimated and mapped during a site visit in the 2nd quarter (March-May). Each phase receives an estimate for the percentage of the mitigation covered by standing water and saturated soils.

b) Results

The hydrology of Balboa Enhancement was not altered during treatment. The depth, duration, and location of saturated and inundated soils have remained largely unchanged of the monitoring period. Any changes observed were more likely due to the variation in precipitation from year to year. Regardless of precipitation variation, the site remains saturated well into the growing season.

2. Vegetation

a) Enhancement Methods

Rare species monitoring on the Balboa Unit enhancement area is required by the MIP to occur annually. Monitoring was conducted on June 14th through June 17th and June 20th. Three rare plant species were monitored. Data collection included:

- Frequency of *Aster curtus* in 2464 1m² plots
- Complete census, number of reproductive plants, and number of inflorescences per reproductive plant for *Erigeron decumbens* ssp. *decumbens*
- Complete census, numbers of seedling, vegetative, and reproductive plants, and number of inflorescences per reproductive plant for *Horkelia congesta* var. *congesta*

Two types of woody vegetation monitoring data were collected. Line-intercept data were collected from 18 transects in 2 Macroplots. A census of all the trees in these macroplots was also completed. Data collection occurred for both activities between June 30th and July 5th. These data are compared to the baseline data collected in 1999 (prior to woody vegetation removal).

Qualitative monitoring for the site included an update to the plant species lists for the Balboa Enhancement Unit. This list can be viewed in Appendix B.

b) Rare Plant Monitoring Results

Two of the three rare species increased in 2005 (Figure 6.2). Both the *Aster curtus* population and the number of *Horkelia congesta* var. *congesta* increased from 2004 to 2005. This represents the second year of increases for both species. The number of *Erigeron decumbens* ssp. *decumbens* crowns decreased by 44 crowns.

The data collected in 1999 was before the initial woody vegetation removal, and can therefore be used to begin to investigate the effects of woody vegetation removal on these populations. It appears that the removal of trees and shrubs has not adversely impacted the populations *Horkelia congesta* var. *congesta* or *Aster curtus* and has likely helped to promote the population expansion of *Aster curtus*. Despite the continued decline of *Erigeron decumbens* ssp. *decumbens*, the removal of woody vegetation may have had some influence on the number of flowers produced per crowns of *Erigeron decumbens* ssp. *decumbens*. The flowering of *Erigeron decumbens* ssp. *decumbens* was up by 31% in 2004. The recent decline in 2005 appears to be related to other factors (precipitation and vole herbivory) rather than 1999 treatment. The lack of treatment since 1999 may have helped to increase the vole population by increasing woody vegetation that provides cover from predators.

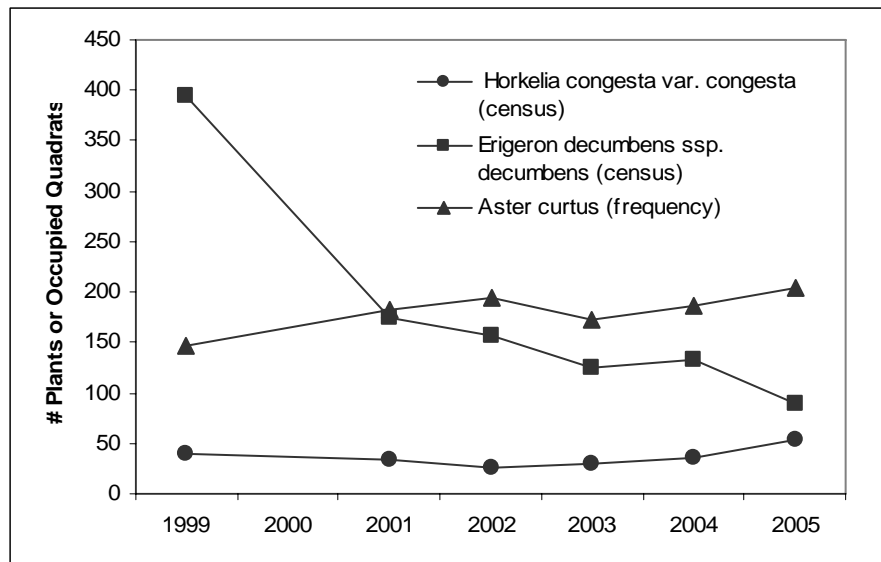


Figure 6.3. Rare plant population trends on the Balboa enhancement.

Census data for *Horkelia congesta* var. *congesta* and *Erigeron decumbens* ssp. *decumbens* and frequency data for *Aster curtus* are plotted from 1999-2005, excluding 2000.

Erigeron decumbens ssp. *decumbens*

The number of *Erigeron decumbens* ssp. *decumbens* plants observed from decreased by 44 individuals between 2004 and 2005 (Table 6.3). Between 1999 and 2005 the population has decreased by 305 plants, a 77% decline.

Table 6.3. *Erigeron decumbens* ssp. *decumbens* population trends from 1999 and 2001-2005.

Attributes for the *Erigeron decumbens* ssp. *decumbens* population on the Balboa Unit enhancement are given for 1999 and 2001-2005.

<i>Erigeron decumbens</i> ssp. <i>decumbens</i>	1999	2000	2001	2002	2003	2004	2005
Total # of plants	394	No data	175	156	124	133	89
% of plants reproductive	71.1%	No data	48.6%	96.7%	94.3%	87.2%	90.0%
Avg. # of flowers per reproductive plant	4.8	No data	11.2	14.4	11.0	11.1	7.0
Total # flowers	1349	No data	1736	2175	1292	1282	562

Horkelia congesta var. *congesta*

The *Horkelia congesta* var. *congesta* population increased by 18 individuals from 2004 to 2005 (Table 6.4). The total number of plants has increased by 14 individuals between 1999 and 2005.

Table 6.4. *Horkelia congesta* var. *congesta* population trends from 1999 and 2001-2005.

Attributes for the *Horkelia congesta* var. *congesta* population on the Balboa Unit enhancement are given for 1999 and 2001-2005.

<i>Horkelia congesta</i> var. <i>congesta</i>	1999	2000	2001	2002	2003	2004	2005
Total # of plants	39	No data	33	25	30	35	53
Total # flowering stems	31	No data	30	45	31	58	31

Aster curtus

The frequency of *Aster curtus* increased from 2004 to 2005 by 24 (Table 6.5). The frequency has increased by 63 between 1999 and 2005.

Table 6.5. *Aster curtus* frequency on the Balboa Unit enhancement from 1999 to 2005.

<i>Aster curtus</i>	1999	2000	2001	2002	2003	2004	2005
Total # of plots occupied	147	No data	182	195	172	187	204

c) Woody Vegetation Monitoring Results

The percent cover of shrubs was reduced in both macroplots (Tables 6.6 and 6.7). Total shrub cover decreased in macroplot 1 by 56.5% and in macroplot 2 by 28.9%. The cover of non-native shrubs was reduced by 64% in macroplot 1 and 59% in macroplot 2 while non-native shrub cover decreased by 4.7% (macroplot 1) and 21.5% (macroplot 2). The most prevalent shrubs in both macroplots were *Rubus armeniacus* and *Rosa nutkana*. The percent cover of *Rubus armeniacus* was reduced by 70% in macroplot 1 and 60% in macroplot 2. The percent cover of *Rosa nutkana* decrease 49% in macroplot 1 and 23% in macroplot 2.

Results of the tree census showed a 62% decrease in the number trees in the enhancement area (Table 6.8). *Crataegus douglasii* was the dominant (most numerous) tree in 1999 (pre-treatment), with *Fraxinus latifolia* being the second most numerous species. Data collected in 2005 show that while *Crataegus douglasii* tended not to resprout after cutting, while *Fraxinus latifolia* continues to produce many suckers. There were 956 *Crataegus douglasii* trees less than a meter tall in 1999. This number was reduced to 63 by 2005. In contrast, the number of *Fraxinus latifolia* trees less than one meter tall increase from 901 in 1999 to 1827 in 2005. This was undoubtedly due to suckering of previously cut stumps. If all trees less than a meter tall are removed from the analysis (for both 1999 and 2005), the number of trees in the enhancement area were reduced by 93%.

Table 6.6. Shrub Percent Cover in the Balboa Enhancement Macroplot 1 (East) in 1999 and 2005.

The table includes all shrub species found in the Balboa Enhancement Macroplot 1 in 1999 (prior to woody vegetation removal) and 2005 (6 years post treatment). The percent cover of each species in each year, with one standard deviation, is also listed. Below the species level information, the total shrub percent cover, total native shrub percent cover, total non-native shrub percent cover, and the percent change in each are included.

N = native I = introduced UNK = unknown origin		N = 20 lines		N = 18 lines	
		Mean % Cover	Standard Deviation	Mean % Cover	Standard Deviation
Total Shrub Cover		50.6%	10.2%	22.0%	6.3%
Origin	Species				
I	<i>Rubus armeniacus</i>	32.9%	13.6%	9.8%	8.2%
N	<i>Rosa nutkana</i>	19.9%	13.9%	10.2%	7.1%
N	<i>Amelanchier alnifolia</i>	3.0%	3.4%	1.6%	3.6%
N	<i>Spiraea douglasii</i>	3.0%	6.5%	0.7%	1.7%
UNK	<i>Rosa</i> sp.	2.8%	3.0%	0.0%	0.0%
I	<i>Rubus laciniatus</i>	0.5%	0.9%	0.0%	0.1%
N	<i>Toxicodendron diversiloba</i>	0.3%	1.1%	0.2%	0.7%
I	<i>Rosa eglanteria</i>	0.3%	0.7%	0.0%	0.0%
I	<i>Cytisus scoparius</i>	0.2%	0.8%	0.2%	0.6%
I	<i>Crataegus monogyna</i>	0.0%	0.0%	0.2%	0.3%
I	<i>Crataegus monogyna</i> x <i>suksdorfii</i>	0.0%	0.0%	1.6%	0.9%
N	<i>Crataegus suksdorfii</i>	0.0%	0.0%	0.0%	0.1%
N	<i>Malus fusca</i>	0.0%	0.0%	0.1%	0.3%
N	<i>Rhamnus purshianus</i>	0.0%	0.0%	0.2%	0.6%
I	<i>Pyrus communis</i>	0.0%	0.0%	0.1%	0.3%
I	<i>Rosa multiflora</i>	0.0%	0.0%	0.4%	0.6%

Table 6.7. Shrub Percent Cover in the Balboa Enhancement Macroplot 2 (West) in 1999 and 2005.

The table includes all shrub species found in the Balboa Enhancement Macroplot 2 in 1999 (prior to woody vegetation removal) and 2005 (6 years post treatment). The percent cover of each species in each year, with one standard deviation, is also listed. Below the species level information, the total shrub percent cover, total native shrub percent cover, total non-native shrub percent cover, and the percent change in each are included.

N = native I = introduced UNK = unknown origin		N = 20 lines		N = 18 lines	
		Mean	Standard	Mean	Standard
		% Cover	Deviation	% Cover	Deviation
Total Shrub Cover		35.8%	6.9%	25.5%	9.0%
Origin	Species				
N	<i>Rosa nutkana</i>	25.5%	6.9%	19.8%	7.8%
I	<i>Rubus armeniacus</i>	10.7%	6.1%	4.2%	5.5%
UNK	<i>Rosa</i> sp.	0.7%	1.8%	0.0%	0.0%
N	<i>Amelanchier alnifolia</i>	0.7%	1.1%	0.3%	0.8%
N	<i>Spiraea douglasii</i>	0.6%	2.0%	0.0%	0.2%
I	<i>Rosa eglanteria</i>	0.3%	0.6%	0.0%	0.0%
I	<i>Rubus laciniatus</i>	0.1%	0.2%	0.0%	0.0%
I	<i>Crataegus monogyna</i>	0.0%	0.0%	0.0%	0.0%
I	<i>Crataegus monogyna</i> x <i>suksdorfii</i>	0.0%	0.0%	0.1%	0.1%
N	<i>Crataegus suksdorfii</i>	0.0%	0.0%	0.8%	0.6%
I	<i>Cytisus scoparius</i>	0.0%	0.0%	0.0%	0.0%
N	<i>Malus fusca</i>	0.0%	0.0%	0.0%	0.1%
N	<i>Rhamnus purshianus</i>	0.0%	0.0%	0.0%	0.0%
I	<i>Pyrus communis</i>	0.0%	0.0%	0.0%	0.2%
I	<i>Rosa multiflora</i>	0.0%	0.0%	0.3%	0.6%
N	<i>Toxicodendron diversiloba</i>	0.0%	0.0%	0.1%	0.3%

Table 6.8. Tree Census Results from the Balboa Enhancement in 1999 and 2005.

The table includes all tree species found in the Balboa Enhancement, whether the trees are native or non-native in origin, totals by height class and species, and the percent reduction in trees.

N /I	Species	Number of trees by height class								Species total	
		1-2 m		2-3 m		3-4 m		>4 m		1999	2005
		1999	2005	1999	2005	1999	2005	1999	2005		
N	<i>Crataegus douglasii</i>	953	63	1,031	26	389	23	358	64	2,731	176
I	<i>Crataegus hybrid</i>	324	166	264	13	119	0	86	0	793	179
I	<i>Crataegus monogyna</i>	421	10	164	0	80	0	25	0	690	10
N	<i>Fraxinus latifolia</i>	901	1827	420	42	211	29	370	22	1,902	1,920
N	<i>Populus trichocarpa</i>	2	0	0	0	0	0	2	0	4	0
I	<i>Prunus avium</i>	0	4	1	0	0	0	0	0	1	4
I	<i>Pyrus communis</i>	52	81	23	3	13	11	26	8	114	103
N	<i>Malus fusca</i>	8	3	31	7	23	2	16	0	78	12
N	<i>Rhamnus purshiana</i>	5	1	7	5	2	1	10	3	24	10
N	<i>Quercus kelloggii</i>	1	1	0	0	0	0	0	0	1	1
										Grand totals	
Totals by height class		2,667	2,156	1,941	96	837	66	893	97	6,338	2,415

Percent reduction between 1999 and 2005 in the total number of trees = 62%

Percent reduction if the height class 1-2 m (sucker growth) is removed = 93%

3. Wildlife Utilization

The Balboa Unit remained a popular site for wildlife and the species sighted were similar to those of previous years. Canadian geese, mallards, blue heron, deer and killdeer were the most commonly sighted waterfowl. In addition to waterfowl, common garter snakes and Pacific treefrogs were also observed on the site. A great egret was also seen again in the northwest emergent area.

Chapter 7. Dragonfly Bend Unit

A. Site Description

1. **Size:** 76.8 acres
2. **Ownership:** City of Eugene
3. **Site Timeline:**

Table 7.1 Dragonfly Bend Unit site timeline.

Section	Treatment and Construction Years	Acreage	Monitoring Period
Phase 1 Enhancement	2004	39.7	2005-2009
Phase 2 Enhancement	2004-2005	8.0	2006-2010

4. Location

The Dragonfly Bend Unit is located at the northeastern corner of Royal Avenue and Greenhill Road, but begins northeast of the Amazon Diversion Channel. It is bordered to the west by North Greenhill Road, the southwest by the Amazon Diversion Channel, the south by Royal Avenue, and the east and north by Amazon Creek.

5. Baseline Conditions

Historically, the site was likely dominated by wet prairie with some vernal pool and emergent vegetation. However, over the past fifty year, it has been in agricultural use. Immediately prior to enhancement, the field was in annual rye grass production.

6. Focus of Prescriptions

Phase 1 and 2 will be restored from an annual ryegrass field to a mosaic of emergent, vernal pool, wet prairie, and upland prairie habitats. Both phases are first sprayed with a broad-spectrum herbicide and then planted with a seed mix containing only broadleaf plants, sedges, and rushes. Bare root sedges, bare root rushes, forb plugs, and lily bulbs are also planted in designated locations. A grass-specific herbicide is used the first year after planting to remove any residual annual rye grass. Native grasses are then planted the fall of the second season.

Two other non-mitigation bank projects were also completed on this site. A stream channel enhancement designed to create habitat for the Western pond turtle and several upland prairie mounds were built up with soil from the stream channel enhancement to provide habitat for Kincaid's lupine, Fender's blue butterfly, and nesting habitat for the Western pond turtle.

7. Site-Specific Management Goals

1. Restore the mosaic of native wetland and upland vegetation.
2. Provide suitable habitat for the Fender's blue butterfly and Kincaid's lupine.
3. Provide suitable Western pond turtle habitat areas along and adjacent to Amazon Creek.



Figure 7.1. Dragonfly Bend Unit – 2005 Project Map and Planting Plan.

The map shows the mitigation areas with Phase 1 in blue and green and Phase 2 in pink. Lily bulb and forb plug planting areas are also shown on the map in solid black or dashed boxes, depending on the phase. Areas in orange and yellow are upland and stream enhancement projects, respectively.

B. 2005 Monitoring Summary

Phase 1

Monitoring results show the area is on track to meet 2nd-year hydrology and vegetation standards. Construction does not appear to have significantly altered pre-existing wetland hydrology. The site may hold more water for longer into the growing season, due to the removal of agricultural drainage channels and the creation of a berm on the western side of the site. Of the 59 species seeded in 2004, 39 were observed within the project in 2005.

Phase 2

Phase 2 was sprayed twice with a broad-spectrum herbicide to exhaust the annual rye grass seed bank. The area was then seeded with a wet prairie/vernal pool seed mix and planted with forb and grass plugs as well as lily bulbs. Monitoring begins in 2006.

1. 2005 Management Actions

Phase 1:

1. Sprayed Phase 1 with Poast ©, a grass specific herbicide, on May 25th to remove annual ryegrass (*Lolium multiflorum*).
2. A contract crew spent two weeks spot-spraying non-native forbs in July.
3. Two diverse seed mixes of grasses and forbs were spread over the site to add native grasses to the site and increase forb diversity (Tables 7.2 and 7.3).

Table 7.2. Dragonfly Bend Phase 1 Wet Prairie/Vernal Pool Grass Addition and Forb Over-seed Mix.

39 acres were seeded with a wet prairie/vernal pool mix designed to add grasses to the site and increase forb diversity. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the species occupied.

Species	Weight (g)	Seeding Rate (g/acre)	% of Mix
<i>Achillea millefolium</i>	100.0	2.5	0.1
<i>Agrostis exarata</i>	5,061.0	126.5	6.7
<i>Alisma triviale</i>	2,570.0	64.3	3.4
<i>Asclepias speciosa</i>	384.0	9.6	0.5
<i>Aster hallii</i>	1,280.0	23.9	1.7
<i>Brodiaea elegans</i>	20.5	0.5	0.0
<i>Camassia leichtlinii</i>	768.0	19.2	1.0
<i>Camassia quamash</i>	768.0	19.2	1.0
<i>Cardamine penduliflora</i>	10.0	0.6	0.0
<i>Carex densa</i>	661.0	14.5	0.9
<i>Carex feta</i>	75.0	1.9	0.1
<i>Carex pellita</i>	13.0	0.3	0.0
<i>Carex unilateralis</i>	2,749.0	42.2	3.7
<i>Carex vesicaria</i>	44.0	1.1	0.1
<i>Castilleja tenuis</i>	51.0	1.3	0.1
<i>Cicendia quadrangularis</i>	13.0	0.3	0.0
<i>Danthonia californica</i>	1,682.0	42.1	2.2
<i>Deschampsia cespitosa</i>	8,810.0	220.3	11.7
<i>Deschampsia danthanioides</i>	380.5	9.2	0.5

Table 7.2. Dragonfly Bend Phase 1 Wet Prairie/Vernal Pool Grass Addition and Forb Over-seed Mix.

39 acres were seeded with a wet prairie/vernal pool mix designed to add grasses to the site and increase forb diversity. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the species occupied.

Species	Weight (g)	Seeding Rate (g/acre)	% of Mix
<i>Dichanthelium acuminatum</i>	1,159.0	29.0	1.5
<i>Downingia elegans</i>	3,850.0	96.3	5.1
<i>Eleocharis obtusa</i>	68.0	1.7	0.1
<i>Epilobium densiflorum</i>	8,663.0	143.3	11.5
<i>Eriophyllum lanatum</i>	640.0	16.0	0.9
<i>Eryngium petiolatum</i>	643.0	16.1	0.9
<i>Galium trifidum</i>	38.0	1.0	0.1
<i>Gentiana sceptrum</i>	64.0	1.6	0.1
<i>Glyceria occidentalis</i>	2,851.0	43.3	3.8
<i>Grindelia integrifolia</i>	1,925.0	48.1	2.6
<i>Hordeum brachyantherum</i>	6,621.0	144.6	8.8
<i>Juncus acuminatus</i>	1,285.0	22.0	1.7
<i>Juncus bolanderi</i>	154.0	3.9	0.2
<i>Juncus tenuis</i>	320.0	8.0	0.4
<i>Lasthenia glaberrima</i>	206.0	5.2	0.3
<i>Lotus unifoliolatus</i>	192.0	4.8	0.3
<i>Lupinus polyphyllus</i>	384.0	9.6	0.5
<i>Lupinus rivularis</i>	640.0	16.0	0.9
<i>Luzula comosa</i>	256.0	6.4	0.3
<i>Madia glomerata</i>	515.0	9.6	0.7
<i>Madia sativa</i>	192.0	4.8	0.3
<i>Microseris laciniata</i>	1,300.0	32.5	1.7
<i>Montia linearis</i>	92.5	1.7	0.1
<i>Myosotis laxa</i>	68.0	1.0	0.1
<i>Navarretia intertexta</i>	610.0	9.6	0.8
<i>Nemophila menziesii</i>	92.0	2.3	0.1
<i>Perideridia gairdneri</i>	30.0	0.4	0.0
<i>Perideridia oregana</i>	640.0	16.0	0.9
<i>Phlox gracilis</i>	165.0	1.6	0.2
<i>Plagiobothrys figuratus</i>	8,663.0	144.6	11.5
<i>Plectritis congesta</i>	64.0	1.6	0.1
<i>Potentilla gracilis</i>	768.0	19.2	1.0
<i>Prunella vulgaris</i>	896.0	22.4	1.2
<i>Ranunculus alismaefolius</i>	257.0	6.4	0.3
<i>Rorripa curvisiliqua</i>	514.0	12.7	0.7
<i>Rumex salicifolius</i>	2,565.0	64.1	3.4
<i>Saxifraga oregana</i>	192.0	4.8	0.3
<i>Sidalcea cusickii</i>	256.0	6.4	0.3
<i>Sisyrinchium idahoense</i>	22.0	0.3	0.0
<i>Thalictrum polycarpum</i>	128.0	3.2	0.2
<i>Triteleia hyacinthina</i>	195.0	4.9	0.3

Table 7.2. Dragonfly Bend Phase 1 Wet Prairie/Vernal Pool Grass Addition and Forb Over-seed Mix.

39 acres were seeded with a wet prairie/vernal pool mix designed to add grasses to the site and increase forb diversity. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the species occupied.

Species	Weight (g)	Seeding Rate (g/acre)	% of Mix
<i>Veronica peregrina</i>	137.0	3.4	0.2
<i>Wyethia angustifolia</i>	1,280.0	24.8	1.7
<i>Zigadenous venenosus</i>	95.0	1.2	0.1

Table 7.3. Dragonfly Bend Phase 1 Emergent Grass Addition and Forb Over-seed Mix.

1.2 acres were seeded with an emergent mix designed to add grasses to the site and increase forb diversity. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the species occupied.

Species	Weight (g)	Seeding Rate (g/acre)	% of Mix
<i>Alisma triviale</i>	240.0	200.0	7.4
<i>Beckmannia syzigachne</i>	960.0	800.0	29.6
<i>Carex densa</i>	18.0	15.0	0.6
<i>Carex obnupta</i>	240.0	200.0	7.4
<i>Carex unilateralis</i>	30.0	25.0	0.9
<i>Downingia elegans</i>	120.0	100.0	3.7
<i>Eleocharis acicularis</i>	5.0	4.2	0.2
<i>Eleocharis palustris</i>	120.0	100.0	3.7
<i>Epilobium densiflorum</i>	270.0	225.0	8.3
<i>Eryngium petiolatum</i>	30.0	25.0	0.9
<i>Glyceria occidentalis</i>	240.0	200.0	7.4
<i>Hordeum brachyantherum</i>	180.0	150.0	5.6
<i>Juncus acuminatus</i>	60.0	50.0	1.9
<i>Juncus bolanderi</i>	7.0	5.8	0.2
<i>Juncus effusus</i> var. <i>pacificus</i>	60.0	50.0	1.9
<i>Juncus ensifolius</i>	60.0	50.0	1.9
<i>Juncus oxymeris</i>	60.0	50.0	1.9
<i>Juncus patens</i>	36.0	30.0	1.1
<i>Ludwigia palustris</i>	120.0	100.0	3.7
<i>Myosotis laxa</i>	63.0	52.5	1.9
<i>Rorripa curvisiliqua</i>	43.0	35.8	1.3
<i>Rumex salicifolius</i>	120.0	100.0	3.7
<i>Scirpus</i> spp.	70.0	58.3	2.2
<i>Veronica scutellata</i>	90.0	75.0	2.8

1. A total of 8,899 forb and grass plugs of 11 species were planted in wet prairie areas of Phase 1 (Table 7.5).
2. Three year old bulbs were planted in Phase 1 (Table 7.6). There were 7 species of bulbs and a total of 52 flats. Each flat contained approximately 150-250 bulbs.

2. Phase 2:

1. Phase 2 was sprayed with glyphosate on May 25th and July 27th to remove none native species before the initial planting.
2. A diverse seed mix of forbs, sedges, and rushes was spread over the site (Table 7.4).

Table 7.4 Dragonfly Bend Phase 2 Wet Prairie/Vernal Pool Grass Addition and Forb Over-seed Mix.

8 acres were seeded with a wet prairie/vernal pool mix designed to add forb diversity. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the species occupied.

Species	Weight (g)	Seeding Rate (g/acre)	% of Mix
<i>Alisma triviale</i>	200.0	25.0	1.8
<i>Aster hallii</i>	600.0	75.0	5.4
<i>Brodiaea elegans</i>	10.5	1.3	0.1
<i>Camassia leichtlinii</i>	360.0	45.0	3.2
<i>Camassia quamash</i>	360.0	45.0	3.2
<i>Cardamine penduliflora</i>	5.0	0.6	0.0
<i>Carex densa</i>	412.0	51.5	3.7
<i>Carex feta</i>	11.5	1.4	0.1
<i>Carex pellita</i>	4.0	0.5	0.0
<i>Carex stipata</i>	20.0	2.5	0.2
<i>Carex unilateralis</i>	200.0	25.0	1.8
<i>Carex vesicaria</i>	4.0	0.5	0.0
<i>Castilleja tenuis</i>	26.0	3.3	0.2
<i>Cicendia quadrangularis</i>	1.5	0.2	0.0
<i>Downingia elegans</i>	800.0	100.0	7.2
<i>Eleocharis obtusa</i>	7.0	0.9	0.1
<i>Epilobium densiflorum</i>	800.0	100.0	7.2
<i>Eriophyllum lanatum</i>	300.0	37.5	2.7
<i>Eryngium petiolatum</i>	50.0	6.3	0.4
<i>Galium trifidum</i>	11.0	1.4	0.1
<i>Gentiana sceptrum</i>	30.0	3.8	0.3
<i>Grindelia integrifolia</i>	400.0	50.0	3.6
<i>Juncus acuminatus</i>	100.0	12.5	0.9
<i>Juncus bolanderi</i>	12.0	1.5	0.1
<i>Juncus tenuis</i>	150.0	18.8	1.3
<i>Lasthenia glaberrima</i>	16.0	2.0	0.1
<i>Lotus unifolatus</i>	90.0	11.3	0.8
<i>Lupinus polyphyllus</i>	180.0	22.5	1.6
<i>Lupinus rivularis</i>	300.0	37.5	2.7
<i>Luzula comosa</i>	120.0	15.0	1.1

Table 7.4 Dragonfly Bend Phase 2 Wet Prairie/Vernal Pool Grass Addition and Forb Over-seed Mix.

8 acres were seeded with a wet prairie/vernal pool mix designed to add forb diversity. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the species occupied.

Species	Weight (g)	Seeding Rate (g/acre)	% of Mix
<i>Madia glomerata</i>	30.0	3.8	0.3
<i>Madia sativa</i>	90.0	11.3	0.8
<i>Microseris laciniata</i>	616.0	77.0	5.5
<i>Montia linearis</i>	2.5	0.3	0.0
<i>Myosotis laxa</i>	7.0	0.9	0.1
<i>Navarretia intertexta</i>	50.0	6.3	0.4
<i>Perideridia oregana</i>	300.0	37.5	2.7
<i>Perideridia spp.</i>	6.5	0.8	0.1
<i>Phlox gracilis</i>	20.0	2.5	0.2
<i>Plagiobothrys figuratus</i>	1,471.0	183.9	13.2
<i>Plagiobothrys figuratus</i>	329.0	41.1	3.0
<i>Plectritis congesta</i>	60.0	7.5	0.5
<i>Potentilla gracilis</i>	360.0	45.0	3.2
<i>Prunella vulgaris</i>	420.0	52.5	3.8
<i>Ranunculus alismafolius</i>	20.0	2.5	0.2
<i>Rorripa curvisiliqua</i>	40.0	5.0	0.4
<i>Rumex salicifolius</i>	800.0	100.0	7.2
<i>Saxifraga oregana</i>	91.0	11.4	0.8
<i>Sisyrinchium idahoense</i>	18.0	2.3	0.2
<i>Thalictrum polycarpum</i>	60.0	7.5	0.5
<i>Triteleia hyacinthina</i>	90.0	11.3	0.8
<i>Veronica peregrina</i>	10.0	1.3	0.1
<i>Wyethia angustifolia</i>	600.0	75.0	5.4
<i>Zigadenous venenosus</i>	44.0	5.5	0.4

3. A total of 2,466 forb and grass plugs of 11 species were planted in wet prairie areas of Phase 2 (Table 7.5).
4. Three year old bulbs were planted in Phase 2 (Table 7.6). There were 7 species of bulbs and a total of 16 flats. Each flat contained approximately 150-250 bulbs.

Table 7.5. Forb and Grass Plugs Planted in Dragonfly Bend Phases 1 and 2.

Species of forbs planted in Dragonfly Bend Phases 1 and 2 are listed with the number of plugs planted in each phase and the total number planted.

Species	Number of Plugs		
	Phase 1	Phase 2	Total
<i>Achillea millefolium</i>	1,648	459	2,107
<i>Asclepias speciosa</i>	238	19	257
<i>Aster hallii</i>	120	248	368
<i>Dichanthelium acuminatum</i>	115	0	115
<i>Festuca roemerii</i>	2,854	571	3,425
<i>Lupinus rivularis</i>	489	202	691
<i>Potentilla gracilis</i> var. <i>gracilis</i>	1,134	333	1,467
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	820	353	1,173
<i>Ranunculus occidentalis</i> var. <i>occidentalis</i>	131	0	131
<i>Rumex salicifolius</i>	366	0	366
<i>Sidalcea cusickii</i>	23	0	23
<i>Wyethia angustifolia</i>	961	281	1,242
Total	8,899	2,466	11,365

Table 7.6. Bulbs Planted in Dragonfly Bend Phases 1 and 2.

Species of bulbs planted in Dragonfly Bend Phases 1 and 2 are listed with the number of flats planted in each phase and the total number of flats planted.

Species	Number of Bulb Flats		
	Phase 1	Phase 2	Total
<i>Allium amplexans</i>	8	2	10
<i>Brodiaea coronaria</i>	4	1	5
<i>Camassia leichtlinii</i> var. <i>suksdorfii</i>	8	1	9
<i>Camassia quamash</i> var. <i>maxima</i>	8	2	10
<i>Dichelostemma congestum</i>	4	1	5
<i>Triteleia hyacinthina</i>	7	3	10
<i>Zigadenus venenosus</i> var. <i>venenosus</i>	7	2	9
Total	52	16	68

3. Management Actions for 2006

Phase 1:

1. Hand weed and spot herbicide non-native forbs.
2. Assess areas where non-native asters (*Lactuca saligna* and *L. serriola*) were observed in high densities to see if more substantial remedial action is necessary.
3. Re-seed all areas where major weed control efforts take place in 2006.
4. Plant ash trees in small area along Royal Avenue between the house and the Diversion Channel levee.

Phase 2:

1. Spray with grass-specific herbicide to remove any residual annual ryegrass.

2. Spot herbicide common invasive forbs.
3. Seed native grasses and augment forb diversity with additional seed in the fall.
4. Remove weeds from southeastern corner (along Royal Avenue) and re-seed with an emergent mix.
5. Remove the rocky strip that was formally part of the haul road on the edge of the site near Royal Avenue. After removal, re-grade and re-seed the disturbed area.

Table 7.7. Progress of the Dragonfly Unit Enhancements towards meeting the MOA vegetation standards.

The most recent data for each section are compared to their relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Vegetation Standard in MOA	Phase 1	Goal Met?	Phase 2	Goal Met?
Site status in the monitoring period	2005-2009	N/A	2006-2010	N/A
Hydric soils	Present	Yes	Present	Yes
Wetland Hydrology	Present	Yes	Present	Yes
Hydrophytic Vegetation	Present	Yes	Present	Yes
50% native cover after 5 years	2009	TBD	2010	TBD
The combined cover of <i>Phalaris arundinacea</i> , <i>Dipsacus fullonum</i> , and <i>Rubus armeniacus</i> shall not exceed 10% of the total cover in the enhancements.	2009	TBD	2010	TBD

C. Monitoring Results

1. Hydrology

a) Methods

Hydrology monitoring began in 2005 for Phase 1. Monitoring consisted of mapping saturated and inundated soils in late March and late May as well as collecting data from one staff gauge.

Hydrology monitoring will begin in 2006 for Phase 2.

b) Results

March rainfall was less than average, resulting in less surficial soil saturation and inundation in March than in May. On March 25th, 10% of the site had standing water and 25% was saturated, while on May 23rd, 15% was inundated and 85% was saturated to the soil surface. With so much of the site saturated in late May, wetland hydrology appears to have been sustained through site construction.

2. Vegetation

a) Methods

A seeding assessment was completed on June 8th and July 19th of 2005. Each species seeded that was observed during the site visit was given a value of 'Dominant,' 'Common,' 'Uncommon,' or 'Trace.'

b) Results

Three seed mixes were planted in the Dragonfly Bend enhancement area (Tables 7.8-7.10): 1) 39 acres of wet prairie, 2) 16 acres of vernal pool, and 3) 2 acres of emergent. No grass species were included in the mixes because the site was treated with a grass-specific herbicide in 2005 to remove any remaining annual ryegrass. Of the 32 species seeded in the wet prairie mix, 3 were 'Dominant,' 3 were 'Common,' 5 were 'Uncommon,' 9 were in 'Trace' amounts, and 12 were not observed. In the vernal pool mix, 17 species were planted—4 were 'Dominant,' 4 were 'Common,' 3 were 'Uncommon,' 3 were in 'Trace' amounts, and 3 were not observed. Of the 25 emergent species planted, 3 were 'Dominant,' 0 were 'Common,' 11 were 'Uncommon,' 7 were in 'Trace' amounts, and 4 were absent.

The absence of grasses in the seed mixes resulted in a different plant community the first year after seeding compared to previous WEW Mitigation Bank projects. The same forb species were successful, but they were present in much higher numbers and were much more robust plants. Many of the perennials flowered the first year, which was uncommon on previous projects. Three species were generally dominant throughout the site. In wet prairie areas, *Epilobium densiflorum* dominated. *Juncus bufonius* and *Gnaphalium palustre*, which were not seeded, dominated the vernal pool areas.

Table 7.8. Dragonfly Bend Phase 1 Wet Prairie mix with seeding success ranks.

39 acres were seeded with a wet prairie mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Allium amplexans</i>		299.5	7.7	0.4%
<i>Aster hallii</i>	C	7800.0	200.0	9.3%
<i>Camassia leichtlinii</i>		780.0	20.0	0.9%
<i>Camassia quamash</i>		4680.0	120.0	5.6%
<i>Carex densa</i>	T	975.0	25.0	1.2%
<i>Carex unilateralis</i>	T	977.0	25.1	1.2%
<i>Castilleja tenuis</i>	U	507.0	13.0	0.6%
<i>Downingia elegans</i>	T	7340.0	188.2	8.7%
<i>Downingia elegans</i> and <i>yina</i>		10.0	0.3	0.0%
<i>Downingia yina</i>	C	295.5	7.6	0.4%
<i>Epilobium densiflorum</i>	D	7800.0	200.0	9.3%
<i>Eriophyllum lanatum</i>	T	585.0	15.0	0.7%
<i>Gentiana sceptrum</i>		117.0	3.0	0.1%
<i>Grindelia integrifolia</i>	D	7800.0	200.0	9.3%
<i>Juncus tenuis</i>		3900.0	100.0	4.6%
<i>Lomatium nudicaule</i>		780.0	20.0	0.9%
<i>Lotus formosissimus</i>		39.0	1.0	0.0%
<i>Lotus unifoliolatus</i>	C	1170.0	30.0	1.4%

Table 7.8. Dragonfly Bend Phase 1 Wet Prairie mix with seeding success ranks.

39 acres were seeded with a wet prairie mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Lupinus rivularis</i>	T	3900.0	100.0	4.6%
<i>Luzula comosa</i>		25.0	0.6	0.0%
<i>Madia sativa</i>	T	1755.0	45.0	2.1%
<i>Microseris laciniata</i>	U	7800.0	200.0	9.3%
<i>Orthocarpus bracteosus</i>	U	39.0	1.0	0.0%
<i>Perideridia oregana</i>		1872.0	48.0	2.2%
<i>Plagiobothrys figuratus</i>	D	7645.0	196.0	9.1%
<i>Potentilla gracilis</i>	U	2925.0	75.0	3.5%
<i>Prunella vulgaris</i>	T	1560.0	40.0	1.9%
<i>Ranunculus orthorhynchus</i>	U	981.0	25.2	1.2%
<i>Rumex salicifolius</i>	T	936.0	24.0	1.1%
<i>Saxifraga oregana</i>	T	273.0	7.0	0.3%
<i>Sisyrinchium idahoense</i>		78.0	2.0	0.1%
<i>Thalictrum polycarpum</i>		390.0	10.0	0.5%
<i>Wyethia angustifolia</i>		7450.0	191.0	8.9%
<i>Zigadenous venenosus</i>		409.5	10.5	0.5%

Table 7.9. Dragonfly Bend Phase 1 Vernal Pool Mix with seeding success ranks.

16 acres were seeded with a wet prairie mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Carex densa</i>	U	1600.0	100.0	11.1%
<i>Carex unilateralis</i>	U	1600.0	100.0	11.1%
<i>Downingia yina</i>		1200.0	75.0	8.3%
<i>Epilobium densiflorum</i>	D	1185.0	74.1	8.2%
<i>Eryngium petiolatum</i>	D	500.0	31.3	3.5%
<i>Gratiola ebracteata</i>	T	226.5	14.2	1.6%
<i>Grindelia integrifolia</i>	D	1600.0	100.0	11.1%
<i>Juncus acuminatus</i>	C	800.0	50.0	5.6%
<i>Juncus bolanderi</i>	U	240.0	15.0	1.7%
<i>Lasthenia glaberrima</i>	T	310.0	19.4	2.2%
<i>Madia glomerata</i>		800.0	50.0	5.6%
<i>Navarretia intertexta</i>	C	400.0	25.0	2.8%
<i>Plagiobothrys figuratus</i>	D	1520.0	95.0	10.6%
<i>Ranunculus alismafolius</i>		800.0	50.0	5.6%
<i>Rorripa curvisiliqua</i>	C	800.0	50.0	5.6%
<i>Rumex salicifolius</i>	T	320.0	20.0	2.2%

Table 7.9. Dragonfly Bend Phase 1 Vernal Pool Mix with seeding success ranks.

16 acres were seeded with a wet prairie mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Veronica peregrina</i>	C	480.0	30.0	3.3%

Table 7.10. Dragonfly Bend Phase 1 Emergent Mix with seeding success ranks.

2 acres were seeded with an emergent mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Alisma triviale</i>	U	200.0	100.0	2.5%
<i>Beckmannia syzigachne</i>	U	4800.0	2400.0	59.1%
<i>Carex densa</i>	U	200.0	100.0	2.5%
<i>Carex obnupta</i>		170.0	85.0	2.1%
<i>Carex unilateralis</i>	U	200.0	100.0	2.5%
<i>Downingia elegans and yina</i>	D	40.0	20.0	0.5%
<i>Downingia yina</i>	D	150.0	75.0	1.8%
<i>Eleocharis obtusa</i>	T	50.0	25.0	0.6%
<i>Eleocharis palustris</i>	U	100.0	50.0	1.2%
<i>Eryngium petiolatum</i>	T	50.0	25.0	0.6%
<i>Glyceria occidentalis</i>	T	200.0	100.0	2.5%
<i>Hordeum brachyantherum</i>		800.0	400.0	9.8%
<i>Juncus acuminatus</i>	U	100.0	50.0	1.2%
<i>Juncus bolanderi</i>	U	30.0	15.0	0.4%
<i>Juncus effusus var. pacificus</i>	U	100.0	50.0	1.2%
<i>Juncus ensifolius</i>	U	80.0	40.0	1.0%
<i>Juncus oxymeris</i>	T	60.0	30.0	0.7%
<i>Juncus patens</i>		60.0	30.0	0.7%
<i>Ludwigia palustris</i>	U	100.0	50.0	1.2%
<i>Myosotis laxa</i>	T	40.0	20.0	0.5%
<i>Polygonum hydropiperoides</i>		100.0	50.0	1.2%
<i>Rorripa curvisiliqua</i>	D	100.0	50.0	1.2%
<i>Rumex salicifolius</i>	T	40.0	20.0	0.5%
<i>Scirpus tabernaemontani</i>		200.0	100.0	2.5%
<i>Sparganium emersum</i>	T	4.0	2.0	0.0%
<i>Veronica scutellata</i>	U	150.0	75.0	1.8%

Chapter 8. Nolan Unit

A. Site Description

1. **Size:** 16.32 acres
2. **Ownership:** City of Eugene
3. **Site Timeline:**

Table 8.1. Nolan Unit site timeline.

Section	Construction Year	Monitoring Period
East	1997	1998-2006*
West	1997	1998-2006*

*Monitoring period has been extended to allow for remedial action.

4. Location

Former site of the partially developed Nolan Industrial Park, the Unit is situated along the north bank of Amazon Creek, east of Beltline Road, and south of 7th Street.

5. Site History

The site was farmed through the late 1970's. In 1980, urban infrastructure was extended to the site. The site was to be developed as an industrial park.

6. Focus of Prescriptions

Restoration and enhancement of wetland prairie and emergent wetland communities. Restoration and enhancement of the wetland was realized through the excavation and removal of fill material, grading and scarifying hydric soils and the installation of water control structures to regulate site hydrology. The site was seeded with native plant species.

7. Site-Specific Management Goals

1. Preserve, enhance, and restore wetlands adjacent to Amazon Creek.
2. Remove fill (previously placed in wetlands) down to the original hydric soil surface, and restore with native emergent wetland vegetation.
3. Enhance existing wetlands by eliminating reed canarygrass from the site.

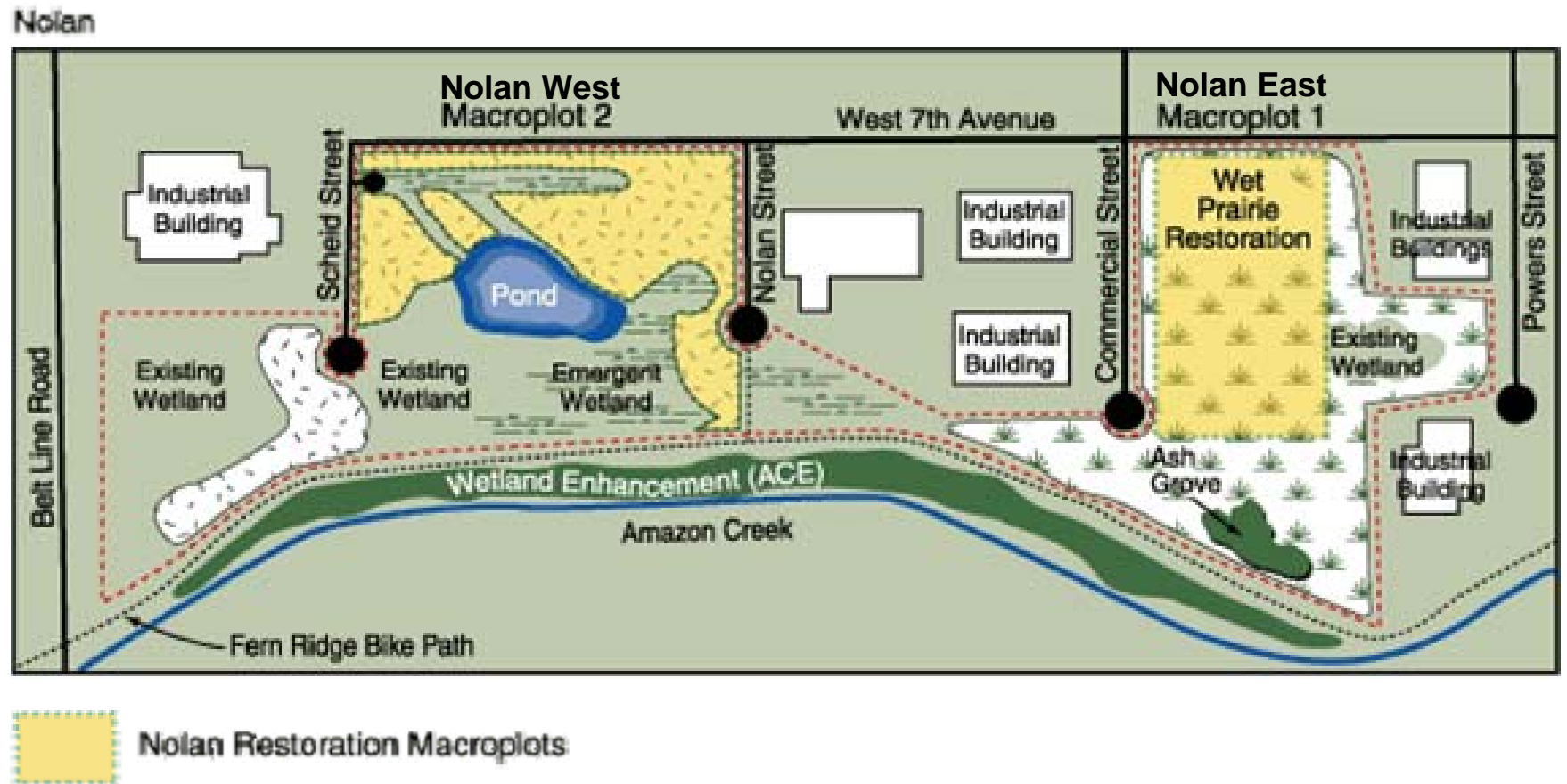


Figure 8.1. Nolan Unit Site Map

Nolan East and Nolan West restorations are labeled with their associated macroplots.

B. 2005 Monitoring Summary

This year was the 8th of a 9-year monitoring period for the Nolan Unit. Both the eastern and western sections continue to demonstrate wetland hydrology sufficient to support the development of wetland soils and vegetation. Pennyroyal continues to persist on the mitigation over large areas, despite many attempts to remove it. To promote a scrub-shrub community, rather than wet prairie, remedial actions taken included the planting of 1,920 willow, 250 Douglas spirea and 27 male Oregon ash trees.

1. 2005 Management Actions

1. Trees and shrubs were planted to encourage the development of a shrub/scrub wetland. Plantings included: 250 Douglas spirea (*Spiraea douglasii*), 27 Oregon ash (*Fraxinus latifolia*), and 1,920 willow (*Salix* spp.).

2. Management Actions for 2006

1. Continue early fall perimeter mow around entire site.
2. Remove teasel (*Dipsacus fullonum*) along bike path edge.
3. Focus on controlling reed canary-grass (*Phalaris arundinacea*) and Harding grass (*Phalaris aquatica*) to prevent its spread.
4. Continue to remove ash and hawthorn as they spread into prairie.
5. Remove fill mounds on western edge (location of former Nolan sign).

Table 8.2. Progress of the Nolan Unit restorations towards meeting the MOA vegetation standards.

The most recent data for each phase is compared to its relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard. 'PI' refers to point-intercept cover data collection.

Site Characteristics and MOA Vegetation Standards for Scrub-Shrub	Nolan East	Goal Met?	Nolan West	Goal Met?
Site status in the monitoring period	Year 8 of 9	N/A	Year 8 of 9	N/A
Hydric soils	Present	Yes	Present	Yes
Wetland hydrology	Present	Yes	Present	Yes
Hydrophytic vegetation	Present	Yes	Present	Yes
1 native woody species must have a cover of at least 30%	2006	N/A	2006	N/A
A minimum of 2 native herbaceous species must comprise at least 75% of the total cover	2006	N/A	2006	N/A

C. Monitoring Results

1. Hydrology

a) Methods

Water depths were measured monthly at 1 staff gauge.

b) Results

Both Nolan East and Nolan West have shown hydrology sufficient for the development of hydric soils. Neither section of Nolan showed any changes in hydrology. Final hydrology monitoring will take place in 2006.

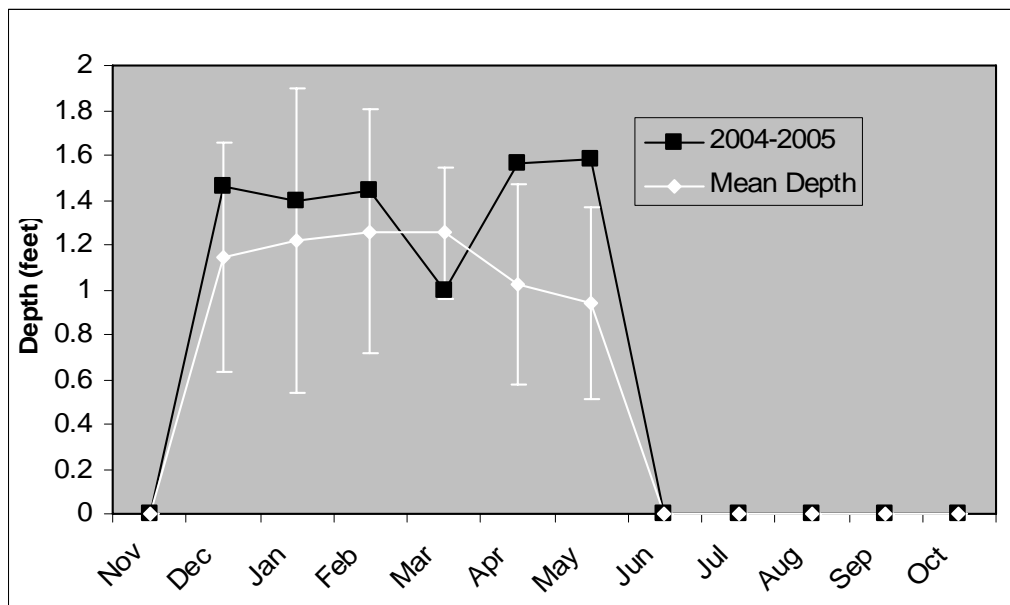


Figure 8.2. Nolan Unit inundation levels in the western section during 2004-2005 compared to the mean and standard deviation of depths between 1998 and 2005.

Depth of inundation throughout the year in the eastern in 2004-2005. The mean and standard deviation calculated from depths observed between 1998 and 2005 are also graphed for comparison.

2. Vegetation**a) Methods**

No quantitative monitoring was scheduled this year on any section of the Nolan Unit. Routine qualitative monitoring, such as photopoints were completed. Point-intercept for the entire site is scheduled for the summer of 2006. Species lists were updated for each section and the results can be viewed in Appendix B.

3. Wildlife Utilization

Waterfowl are attracted by the seasonal pond and remain the most frequent visitors to the site. Specific sightings for this year include Canada geese, mallards, and ring-necked pheasants.

Chapter 9. North Greenhill Prairie

A. Site Description

1. **Size:** 71 acres
2. **Ownership:** BLM
3. **Site Timeline:**

Table 9.1. North Greenhill Prairie Unit site timeline.

Section	Construction Year/s	Acreage	Monitoring Period
Phase 1 Sod-Removal	1998	12.5 acres	1999-2003
Phase 1 Solarization	1998	1.0 acres	1999-2003
Phase 2 Sod-Removal	2000-2001	7.5 acres	2000-2006
Phase 2 Solarization	2000	0.9 acres	2001-2004
Phase 3 Sod-Removal	2002	19.04 acres	2003-2007

4. Location

The site is located on the west side of Greenhill Road, approximately one half mile south of Royal Avenue and approximately three quarters of a mile north of the Southern Pacific Railroad tracks in Township 17 S., Range 4 W., Section 30, tax lot 2100.

5. Site History

Of the 71 acres, 50.6 acres were delineated as farmed wetland. Sampling indicated that approximately 90% of the vegetation was non-native grasses. From conditions observed in February and March of 1997, it was determined that there were three primary sources of water on the site: precipitation directly on the site, flow from the South Greenhill site, and flow from seeps likely fed by run-off from the east side of Oak Hill. The site was farmed for hay production prior to BLM ownership.

6. Focus of Prescriptions

Restore/enhance native wet prairie and vernal pool communities in the former agricultural lands on the site.

7. Site-Specific Management Goals

1. Restore natural hydrology by dispersing water flows currently confined to ditches into broader surface flows.
2. Restore/enhance native wet prairie and vernal pool communities in the agricultural lands on the site.
3. Restore upland prairie vegetation to the tops of mounds situated within the wetland mitigation area.
4. Enhance habitat conditions for native wildlife species associated with wet prairie and ash savanna habitats.
5. Ensure compatibility of wetlands between this mitigation site and the ODOT mitigation site immediately to the south.
6. Take advantage of the large size of the site to establish large areas of contiguous wetland communities on the site and in conjunction with future wetland restoration on adjacent sites to the east and south.

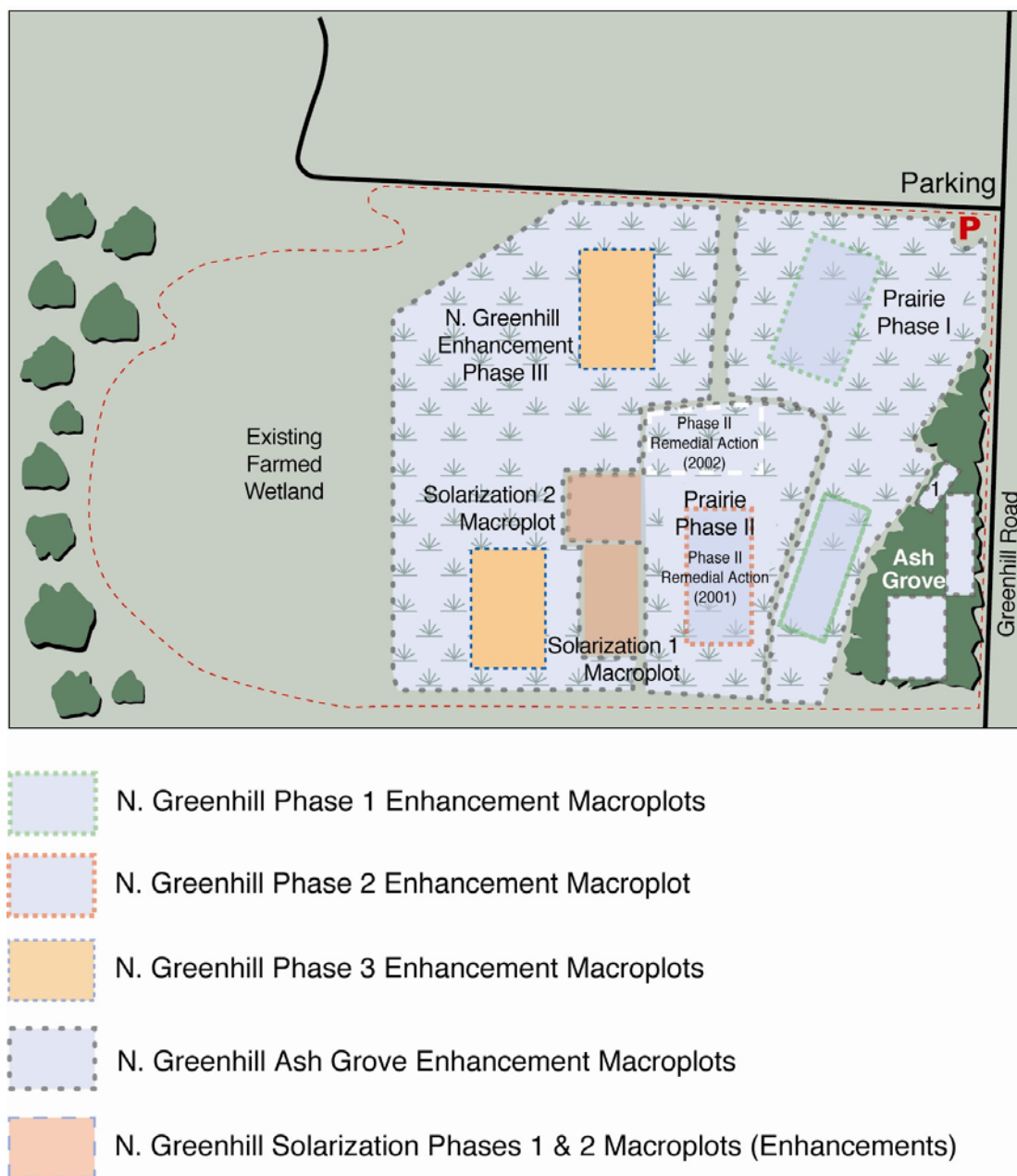


Figure 9.1. North Greenhill Prairie Site Map

The Enhancement Ash Grove area, Phases 1, 2, and 3 sod-removal enhancements as well as Phases 1 and 2 solarization enhancements are labeled with their associated macroplots.

B. 2005 Monitoring Summary

Both the Phase 1 Solarization and Phase 1 Sod-removal are complete projects. The final monitoring report is included in the 2003 Annual Report.

There were no significant changes in Phase 2 Sod-removal. Minor weed issues were addressed and the results of the remedial action will be monitored to see if additional treatment is necessary. Final monitoring of vegetation and hydrology will occur in 2006.

Final quantitative vegetation monitoring for the Phase 2 Solarization occurred in 2005. It met two out of the three vegetation standards. The bank will continue to work to augment native species diversity within the site.

No quantitative vegetation or hydrology data were collected in 2005 for Phase 2. The project met 2nd year standards in 2004 and is on track to meet year 5 cover and diversity standards as well.

1. 2005 Management Actions

Phase 1:

This project has completed its monitoring period. It is currently under BLM management.

Phase 2:

1. A small area with St. John's wort (*Hypericum perforatum*) and hairy cat's ear (*Hypochaeris radicata*) was tilled and reseeded.
2. The site perimeter was mowed to reduce weed invasion.

Phase 3:

1. A maintenance crew spent 340 hours hand weeding non-native species from the area.
2. The site perimeter was mowed to reduce weed invasion.

2. Management Actions for 2006

Phase 1:

This project has completed its monitoring period. It is currently under BLM management.

Phase 2:

1. Hand weed in spring as necessary. Special attention should be given to St. John's wort (*Hypericum perforatum*), hairy cat's ear (*Hypochaeris radicata*), Centaury (*Centaurea erythraeae*), and Parentucellia (*Parentucellia viscosa*).

Phase 3:

1. Continue to hand-weed the restoration area.
2. Continue to mow the perimeter to reduce weed invasion.
3. Mow or burn the whole phase and seed with additional forbs to increase non-grass species diversity and cover.
4. Remove the silt fence from along the southern edge.

Table 9.2. Progress of the North Greenhill Unit Phase 2 and 3 Enhancements towards meeting the MIP vegetation standards.

Progress of the North Greenhill Unit Phase 2 and 3 Enhancements towards meeting the MIP vegetation standards.

The most recent data for each phase is compared to its relevant vegetation standards from the site's MIP. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Site Characteristics and MOA Vegetation Standards	Phase 2				Phase 3	
	Sod-Removal	Goal Met?	Solarization	Goal Met?	Sod-Removal	Goal Met?
Site status in the monitoring period	Year 5 of 6	N/A	Year 5 of 5	N/A	Year 3 of 5	N/A
Hydric soils	Present	Yes	Present	Yes	Present	Yes
Wetland hydrology	Present	Yes	Present	Yes	Present	Yes
Hydrophytic vegetation	Present	Yes	Present	Yes	Present	Yes
Most recent point-intercept cover data collected in:	2003	N/A	2005	N/A	2004	N/A
50% native cover after 2 years	81%	Yes	82%	Yes	MP 1 = 94% MP 2 = 97%	Yes
70% native cover after 5 years	2006	TBD	84.7%	Yes	2007	TBD
70% of the species occurring at 20% cover or greater are native	2006	TBD	1 of 1	Yes	2007	TBD
Minimum of 10 native species occurring at 2% cover or greater	2006	TBD	1	No	2007	TBD

C. Monitoring Results**1. Hydrology****a) Methods**

The extent of standing water and saturated soil were estimated and mapped during site visits in early spring for Phase 2. No hydrology monitoring was required in 2005 for Phase 3.

b) Results*Phase 2*

Phase 2 continues to exhibit hydrology sufficient for the development and maintenance of hydric soils.

Phase 3

No hydrology monitoring was required in 2005. The next time it will be assessed is in the spring of 2007.

2. Vegetation**a) Methods**

Point-intercept data were collected in 1 macroplot within the Phase 2 Solarization in 2005. The macroplot was sampled June 27th and 31st for a total of 205 points.

A species list for each active phase was also updated and can be viewed in Appendix B.

b) Results*Phase 2 Solarization Enhancement: Point-intercept Results*

The project section exceeded the 5th-year vegetation standard that 80% of the total vegetation should be native (Figure 9.2). Of the total plant cover, 85% was generated by native species. *Deschampsia cespitosa* was the only native species with greater than 1% cover, with a percent cover of 58.5% (Figure 9.3). The only non-native species with greater than 1 % cover was *Holcus lanatus* with 15.1% cover. Therefore, the project met the standard that 70% of the species occurring at 20% cover or greater are native, but did not meet the standard requiring that a minimum of 10 native species occur at 2% cover or greater.

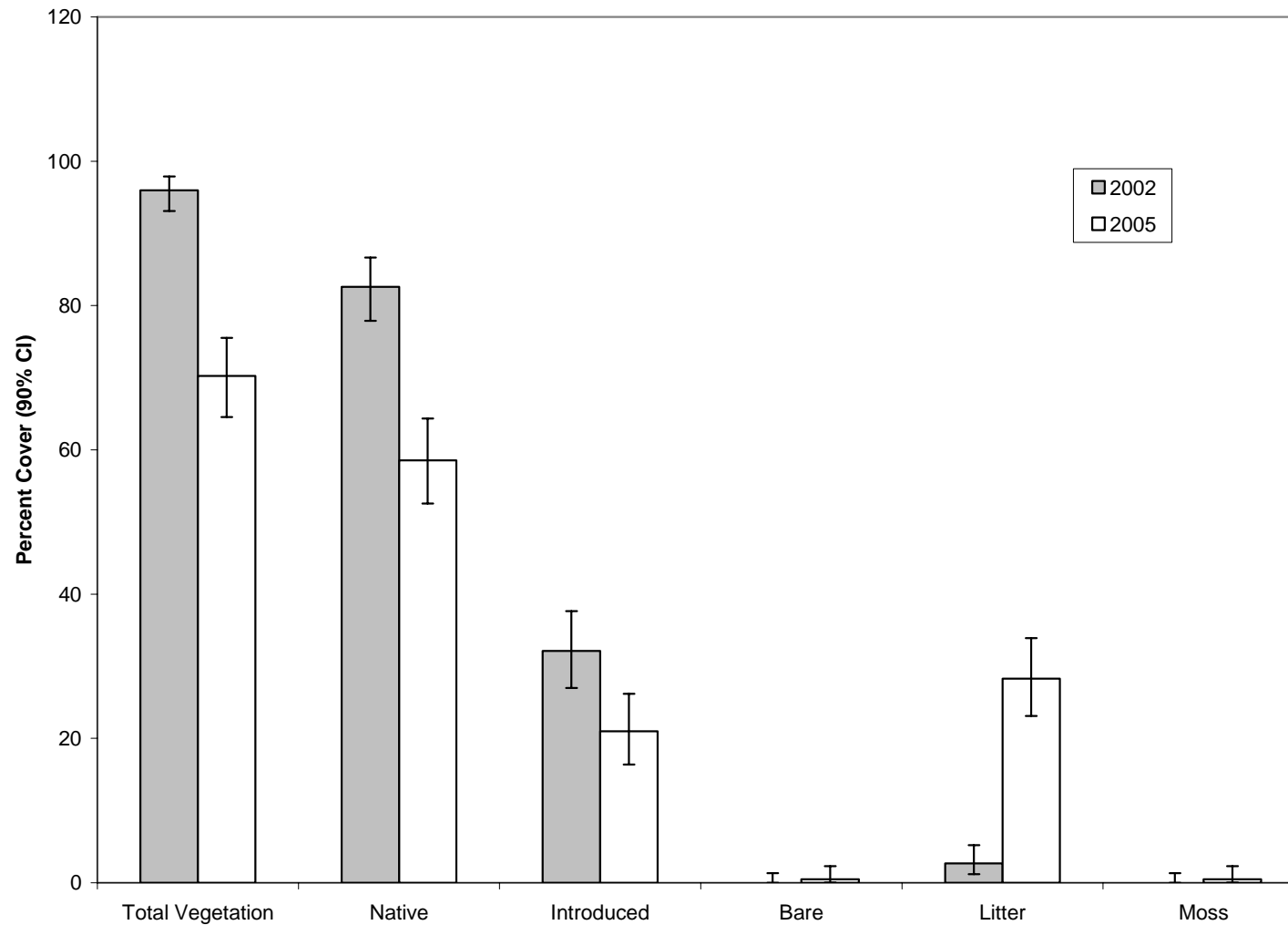


Figure 9.2. Percent cover of ground cover guilds in the North Greenhill Phase 2 Solarization Enhancement in 2002 and 2005.

The total percent cover of all vegetation, native species, introduced species, bare ground, litter, and moss are graphed for the North Greenhill Phase 2 Solarization Enhancement. Data were collected in the 2nd year (2002, n = 224) and 5th year (2005, n = 205) after planting and are displayed with 90% binomial confidence intervals.

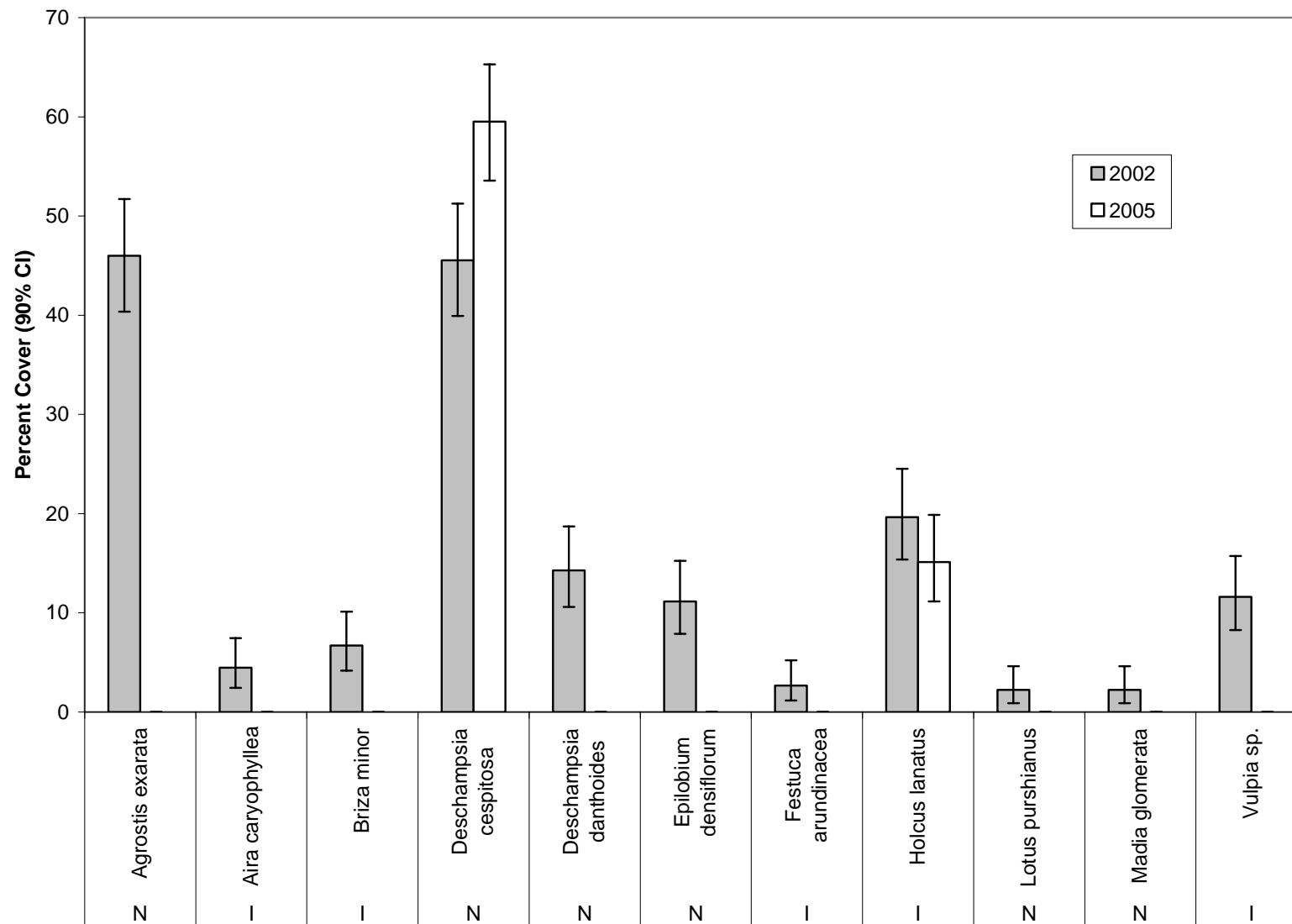


Figure 9.3. Species in the North Greenhill Phase 2 Solarization with > 2% cover in 2002 and 2005.

All species in 2002 (n = 224) and 2005 (n = 205) with greater than two percent cover are graphed with binomial confidence intervals for North Greenhill Phase 2 Solarization.

3. Wildlife Utilization

Wildlife sightings were similar to those of previous years. Western meadowlark, mallard, Canada goose, northern harrier, common snipe, and northern flicker were all bird species commonly observed on the site. Evidence of raccoons and deer noted again this year.

Chapter 10. Oxbow West Unit

A. Site Description

1. **Size:** 57 acres
2. **Ownership:** BLM
3. **Site Timeline:**

Table 10.1. Oxbow West Unit site timeline.

Section	Treatment and Construction Years	Acreage	Monitoring Period
Forest Enhancement	2003	1.12	2004-2008
Western Wet Prairie Enhancement	2003	4.31	2004-2008
Eastern Wet Prairie Enhancement	2003-2005	6.25	2006-2010
Emergent Enhancement	2003	0.29	2004-2008
Emergent Restoration	2003	0.13	2004-2008
Enhanced Wet Prairie and Forest, but we receive no credit (ODOT land)	2003-2005	2.50	N/A

4. Location

The Oxbow West Unit is located at the northern end of North Terry Street. It is bordered by Southern Pacific Railroad tracks to the north, Amazon Creek to the east, and Greenhill Technology Park to the south.

5. Baseline Conditions

The site was used as pasture and for hay production until the early to mid-1990s. Currently, the site contained approximately 51 acres of delineated wetlands, most of which is wet prairie of varying quality, with some smaller patches of forested and emergent wetland. Woody vegetation has colonized much of the wet prairie areas. Oxbow West also supports some of the largest known populations of rare and sensitive plants in west Eugene.

6. Focus of Prescriptions

Treatments at Oxbow West will enhance and restore wet prairie, forested, and emergent habitats. Wet prairie and forest enhancement will remove non-native and native woody vegetation, including reed canarygrass and fruit trees. The restoration and enhancement of the emergent area in the southeast will include the removal of fill material and reed canarygrass.

7. Site-Specific Management Goals

4. Protect and enhance existing rare plant populations where they occur and improve habitat suitable for expansion of these populations.
5. Enhance and restore native wet prairie and vernal pool communities where they are degraded.
6. Control exotic and woody vegetation in the wet and upland prairie.
7. Control exotic vegetation and selectively remove woody vegetation from the forested wetland areas.
8. Minimize the potential impacts to the site from future increased Greenhill Technology Park stormwater runoff.
9. Minimize human access onto the site while providing visual access from the bike path.

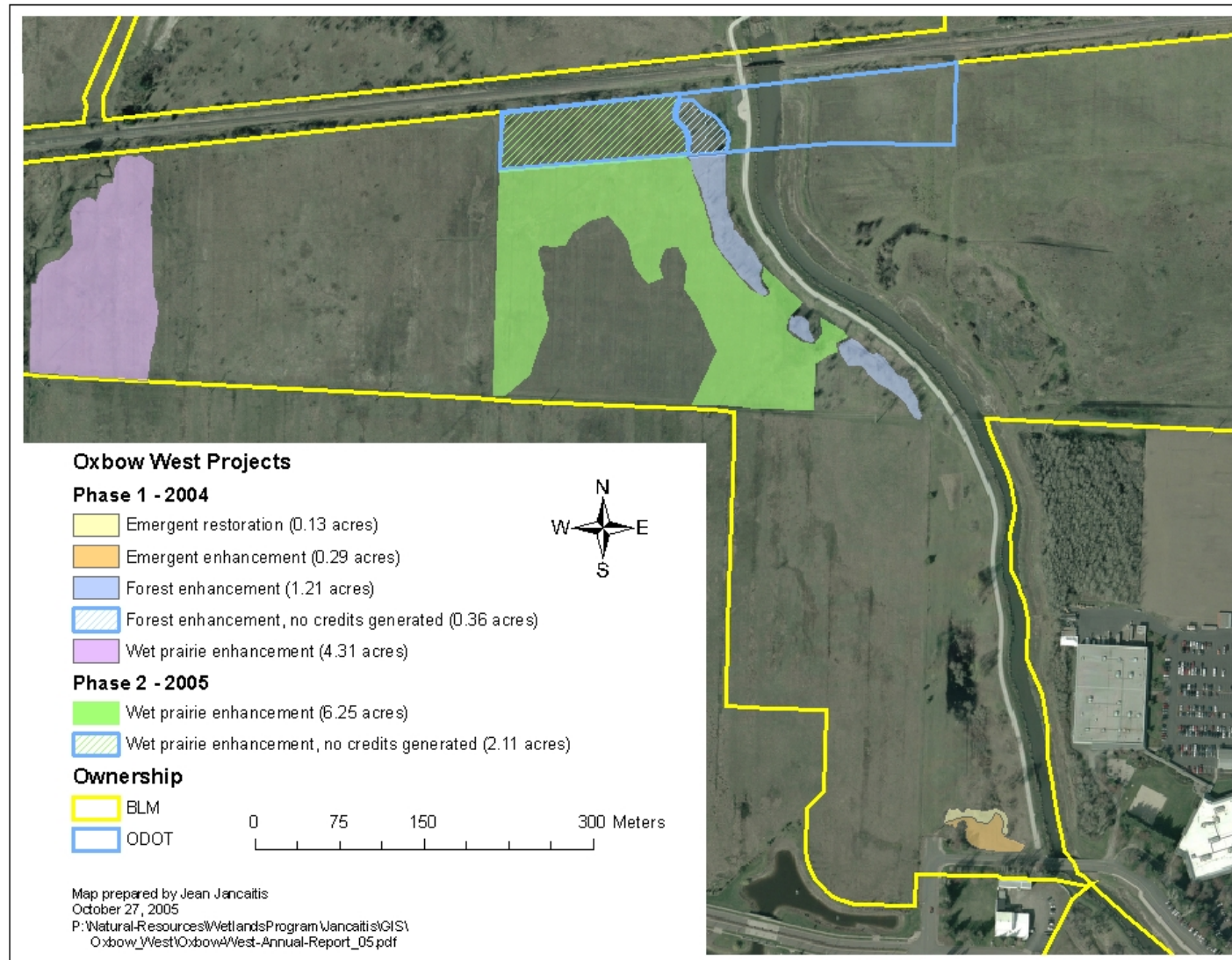


Figure 10.1. **Oxbow West – Mitigation Projects Site Map.**

The map shows the enhancement and restoration areas labeled with their acreages. No credits will be generated from enhancement completed on land owned by the Oregon Department of Transportation.

B. 2005 Monitoring Summary

Four sections of the Oxbow West Unit are being managed as part of the mitigation bank; the western prairie enhancement, eastern prairie enhancement, eastern forest enhancement, and the southern panhandle restoration and enhancement (Figure 10.1). Wetland hydrology continues to persist in the enhancement areas and the southern panhandle restoration and enhancement area. All areas are currently meeting their vegetation goals. Rare plant populations in the enhancements, *Sidalcea cusickii* and *Erigeron decumbens* var. *decumbens*, increased from 2004 and the number of trees in the forest enhancement were reduced by 91%, well above the 50% vegetation standard. Additionally, the vegetation of the panhandle restoration and enhancement met the 2nd year goal of 50% native vegetation with 98% of the total vegetation being native.

1. 2005 Management Actions

1. A Maintenance crew of 4 people spent 3.5 days weeding the Phase 1 Emergent Restoration and Enhancement area.
2. Woody vegetation was removed by hand in the rare plant areas of the Phase 1 Forest Enhancement and the Phase 2 Wet Prairie Enhancement.
3. The entire eastern perimeter of the site was mowed to prevent the spread of invasive species.
4. Covered several patches of reed canarygrass (*Phalaris arundinacea*) with shade cloth.
5. The Phase 1 Wet Prairie Enhancement was burned in late September and then seeded with the following seed mix to increase forb diversity and help prevent weed invasion (Table 10.2).

Table 10.2. Oxbow West Phase 1 Wet Prairie Enhancement Seed Mix.

After burning, the seed mix below was seeded over the Oxbow West Phase 1 Wet Prairie Enhancement (8 acres). The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the species occupied.

Species	Weight (g)	Seeding Rate (g/acre)	% of Mix
<i>Agrostis exarata</i>	920.0	115.0	6.3
<i>Alisma triviale</i>	400.0	50.0	2.7
<i>Aster hallii</i>	600.0	75.0	4.1
<i>Camassia quamash</i>	120.0	15.0	0.8
<i>Carex densa</i>	120.0	15.0	0.8
<i>Danthonia californica</i>	920.0	115.0	6.3
<i>Deschampsia cespitosa</i>	1,600.0	200.0	10.9
<i>Dichanthelium accuminatum</i>	80.0	10.0	0.5
<i>Downingia elegans</i>	400.0	50.0	2.7
<i>Epilobium densiflorum</i>	1,800.0	225.0	12.3
<i>Eriophyllum lanatum</i>	200.0	25.0	1.4
<i>Grindelia integrifolia</i>	400.0	50.0	2.7
<i>Hordeum brachyantherum</i>	1,200.0	150.0	8.2
<i>Lotus unifoliat</i>	120.0	15.0	0.8
<i>Lupinus polyphyllus</i>	240.0	30.0	1.6
<i>Lupinus rivularis</i>	400.0	50.0	2.7
<i>Madia sativa</i>	80.0	10.0	0.5
<i>Microseris laciniata</i>	600.0	75.0	4.1
<i>Plagiobothrys figuratus</i>	1,800.0	225.0	12.3
<i>Potentilla gracilis</i>	240.0	30.0	1.6
<i>Prunella vulgaris</i>	1,600.0	200.0	10.9
<i>Rumex salicifolius</i>	400.0	50.0	2.7

Species	Weight (g)	Seeding Rate (g/acre)	% of Mix
<i>Wyethia angustifolia</i>	400.0	50.0	2.7

2. Management Actions for 2006

1. Remove remaining shade cloth in fall 2006 and seed with aggressive native mix.
2. Continue to remove sucker growth, blackberry (*Rubus armeniacus* and *laciniatus*) and reed canary-grass (*Phalaris arundinacea*) from the enhancement areas using summer crews with weed-wackers.
3. The site perimeter will be mowed.
4. Exotics will be removed using hand tools from the southern panhandle restoration and enhancement.
5. Follow-up on last year's RCG removal throughout the enhancement area. Evaluate areas where shade cloth was removed in the fall to determine plant composition. Hand-dig any RCG coming up in those areas.
6. On the western half of the site (area burned in 2005), evaluate re-growth and map significant weed populations. Look at south west corner of the site to determine if velvet grass (*Holcus lanatus*) is becoming a problem.
7. In the southern end of the forest enhancement area, the Checkermallow (*Sidalcea*) population has begun to increase, but the new plants are being overtopped by early season grass growth. To help expand the *Sidalcea* population, selectively mow (weed-wacker or brush hog) this area in early spring.

Table 10.3. Progress of the Oxbow West Panhandle Unit Restoration and Enhancement towards meeting the MOA vegetation standards.

The most recent data for each section are compared to their relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Site Characteristics and MOA Vegetation Standards	Restoration	Goal Met?
Site status in the monitoring period	Year 2 of 5	N/A
Hydric soils	Present	Yes
Wetland hydrology	Present	Yes
Hydrophytic vegetation	Present	Yes
Most recent quantitative data collected in year:	N/A	N/A
50% native cover after 2 years	98%	Yes
70% native cover after 5 years	2008	N/A
75% of those species occurring at a 50% frequency rate or grater shall be from the Native Plant list	2008	N/A
70% of the planted species shall be alive and present at the end of the five year monitoring period	2008	N/A
Emergent: min 5 native species occurring at 10% frequency rate	2008	N/A

Site Characteristics and MOA Vegetation Standards	Restoration	Goal Met?
or greater		

Table 10.4. Progress of the Oxbow West Unit East and West prairie enhancements, as well as, the forest enhancement towards meeting the vegetation standards.

The most recent data for the enhancement are compared to their relevant vegetation standards from the MIP. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard. 'LI' refers to line-intercept cover data collection.

Site Characteristics and MIP Vegetation Standards	East Prairie Enhancement	Goal Met?	West Prairie Enhancement	Goal Met?
Site status in the monitoring period	Year -0 of 5	N/A	Year 2 of 5	N/A
Hydric soils	Present	Yes	Present	Yes
Wetland hydrology	Present	Yes	Present	Yes
Hydrophytic vegetation	Present	Yes	Present	Yes
Most recent quantitative data collected in:	Pre-treatment during 2003- 2005	N/A	Only qualitative data will be collected	N/A
60% reduction of total shrub cover after 5 years	LI = 2007	N/A	N/A	N/A
70% reduction of tree density after 5 years	Census 2010	N/A	Photopoints 2008	N/A

Table 10.5. Progress of the Oxbow West Unit Forest Enhancement towards meeting the vegetation standard.

The most recent data for the enhancement are compared to their relevant vegetation standard. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Site Characteristics and MIP Vegetation Standards	Enhancement Area	Goal Met?
Site status in the monitoring period	Year 2 of 5	N/A
Hydric soils	Present	Yes
Wetland hydrology	Present	Yes
Hydrophytic vegetation	Present	Yes
Most recent quantitative data collected in:	2005	N/A
50% reduction of tree density after 5 years	91% reduction after 2 years	Yes

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil are estimated and mapped during site visits in early spring (March-May). A staff gauge was installed in the restoration in December of 2004. This is monitored monthly while standing water persists.

b) Results

No major changes in hydrology were observed. All mitigation projects continue to exhibit saturation/inundation levels sufficient for the development and maintenance of hydric soils. After two years of observations, it was decided that the pool level was likely a little too deep in the Emergent Restoration and Enhancement. A board was removed from the stand pipe to lower the water level about 2 inches.

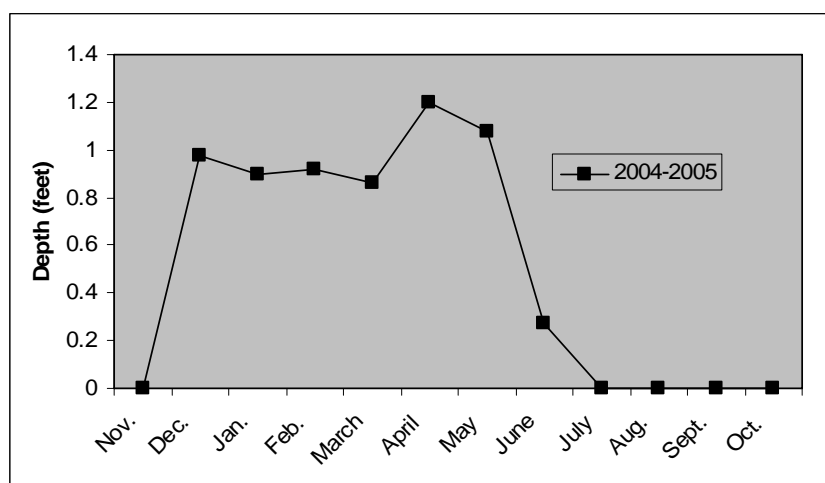


Figure 10.2. Oxbow West emergent restoration and enhancement inundation levels during 2004-2005.

Depth of inundation throughout the year in the southern emergent restoration and enhancement area of Oxbow West in 2004-2005.

2. Vegetation

2004 monitoring of Oxbow West mitigation projects included: (1) a species list compiled for each section that can be viewed in Appendix B, (2) *Sidalcea cusickii* population census in the Phase 1 Forest Enhancement, (3) *Erigeron decumbens* var. *decumbens* macroplot census in the Phase 2 Prairie Enhancement, and (4) point-intercept cover monitoring in the Phase 1 Emergent Restoration and Enhancement.

a) Phase 1 Forest Enhancement *Sidalcea cusickii* Census Methods

A census of the population is taken in late summer by counting the number of plants, the number of flowering spikes, and the number of vegetative 'individuals.' In 2005, the census data were collected on June 28th.

b) Phase 1 Forest Enhancement *Sidalcea cusickii* Census Results

The number of *Sidalcea cusickii* plants observed in 2005 increased from 2004 by 596 plants (Table 10.6). The majority, approximately 80%, of these plants appeared to be seedlings. The seedlings may have resulted from habitat changes created by thinning trees and shrubs in the enhancement.

Table 10.6. Census data for *Sidalcea cusickii* in the Oxbow West Phase 1 Forest Enhancement.

The total number *Sidalcea cusickii* individuals are present for 2003 - 2005. Additional data, including the number of flowering spikes and the number of vegetative individuals, are presented for 2004 and 2005.

Population Attribute	2003	2004	2005
Vegetative 'individuals'	No data	84	586
Flowering Spikes	No data	274	338
Total number of 'individuals'	448	328	924
% of plants reproductive	No data	84%	37%

c) Phase 1 Forest Enhancement Tree Density Sampling Methods

A survey of tree density in the eastern forest was done on June 28th through 30th of 2005. The monitoring crew sampled 47 1m x 14m plots along a 284m baseline that ran north to south through the forested edge. Within each plot, all trees were recorded by height class (1-2m, 2-3m, 3-4m, and > 4m) and species.

d) Results Forest Enhancement Results of Tree Density Sampling:

The density of trees per plot decreased from 21.87 (± 4.18) trees in 2003 to 2.02 (± 0.83) trees in 2005. See Figure 10.3 for the average number of trees per plot by height class and species. Of the two most prevalent species, the total number of *Fraxinus latifolia* per plot decreased from 4.06 (± 1.88) to 1.02 (± 0.48) and *Crataegus suksdorfii* decreased from 3.38 (± 0.93) to 0.55 (± 0.42).

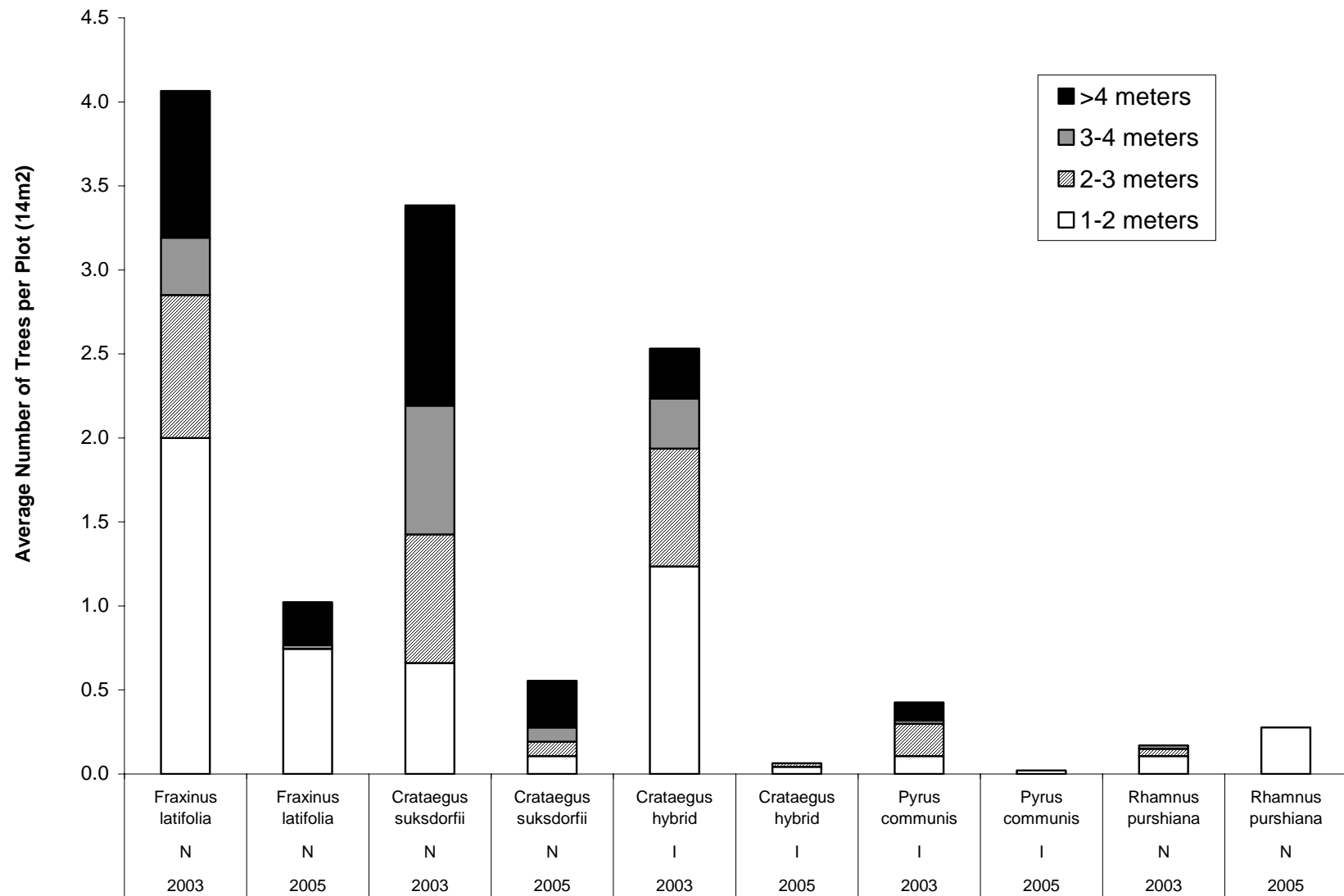


Figure 10.3. Trees Density per plot in the Eastern Forest Enhancement Area of the Oxbow West Unit.

The average number of trees per plot is graphed by separating the most prevalent species into 4 height classes (1-2 meters, 2-3 meters, 3-4 meters, and > 4 meters) for 2003 (pre-treatment) and 2005 (post treatment).

e) Phase 2 Prairie Enhancement *Erigeron decumbens* var. *decumbens* Census Methods

A census of the population is taken annually, beginning in 2004. The number of crowns, flowers, and flowering crowns are recorded. Because the plant reproduced vegetatively as well as through seed, an individual crown is counted when the basal leaves are greater than 3.5 cm apart. Data were collected June 23rd, 24th, and 27th of 2005.

f) Results of the Phase 2 Prairie Enhancement *Erigeron decumbens* var. *decumbens* Macroplot Census

The majority of the *Erigeron decumbens* var. *decumbens* population on Oxbow West lies to the south and west of the plot monitored for the mitigation. The larger portion of the population is part of an experiment to look at the effects of mowing and prescription burning and is not part of the mitigation. The macroplot monitored for the mitigation project encompasses the area where the plants are most concentrated outside of the experiment. The mitigation area was cleared of woody vegetation in the fall of 2003 and monitoring began in 2004.

Within the plot, 161 *Erigeron decumbens* var. *decumbens* crowns were observed (Table 10.7). This is an increase of 95 crowns from 2004. There were a total of 664 flowers, also an increase from 2004. The apparent population increase is likely due to surveying at a more appropriate time of year. The 2004 census was completed in late July.

Table 10.7. Oxbow West *Erigeron decumbens* ssp. *decumbens* macroplot census results.

Attributes for the *Erigeron decumbens* ssp. *decumbens* population on the eastern Oxbow West enhancement are given for 2004 and 2005.

Population Attribute	2004	2005
Total # of crowns	66	161
Number of vegetative crowns	2	23
Number of reproductive crowns	64	138
Total # flowers	489	664
% of reproductive crowns	94%	86%
Avg. # of flowers per reproductive crown	7.8	4.8

g) Phase 1 Emergent Restoration and Enhancement Methods

Point-intercept data were collected July 11th of 2005. A total of 337 points were sampled.

h) Phase 1 Emergent Restoration and Enhancement Point-Intercept Results

The Phase 1 Emergent Restoration and Enhancement met the 2nd year vegetation standard of 50% native cover because 98% of the 26.4% ($22.5\% \leq \mu \leq 30.7\%$) cover was created by native plants (Figure 10.4). However, 50.5% ($45.8\% \leq \mu \leq 55.1\%$) was bare ground and only 3 species had cover values of greater than 2% (Figure 10.5). Action will be necessary to meet dominant species diversity criteria by year 5.

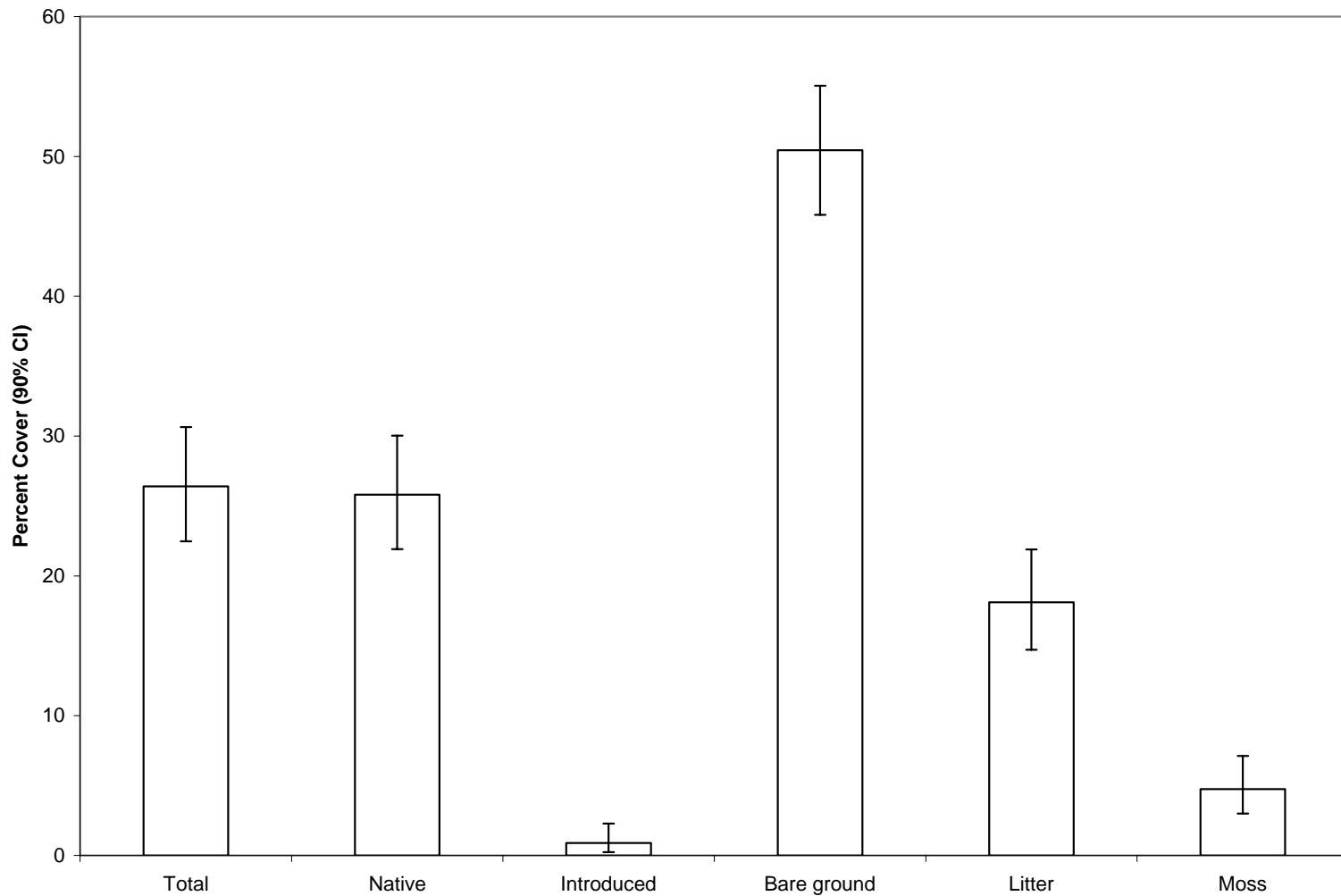


Figure 10.4. Percent cover of ground cover guilds in the Oxbow West Phase 1 Emergent Restoration and Enhancement.

The total percent cover of all vegetation, native species, introduced species, bare ground, litter and moss are graphed for the Oxbow West Phase 1 Emergent Restoration and Enhancement.

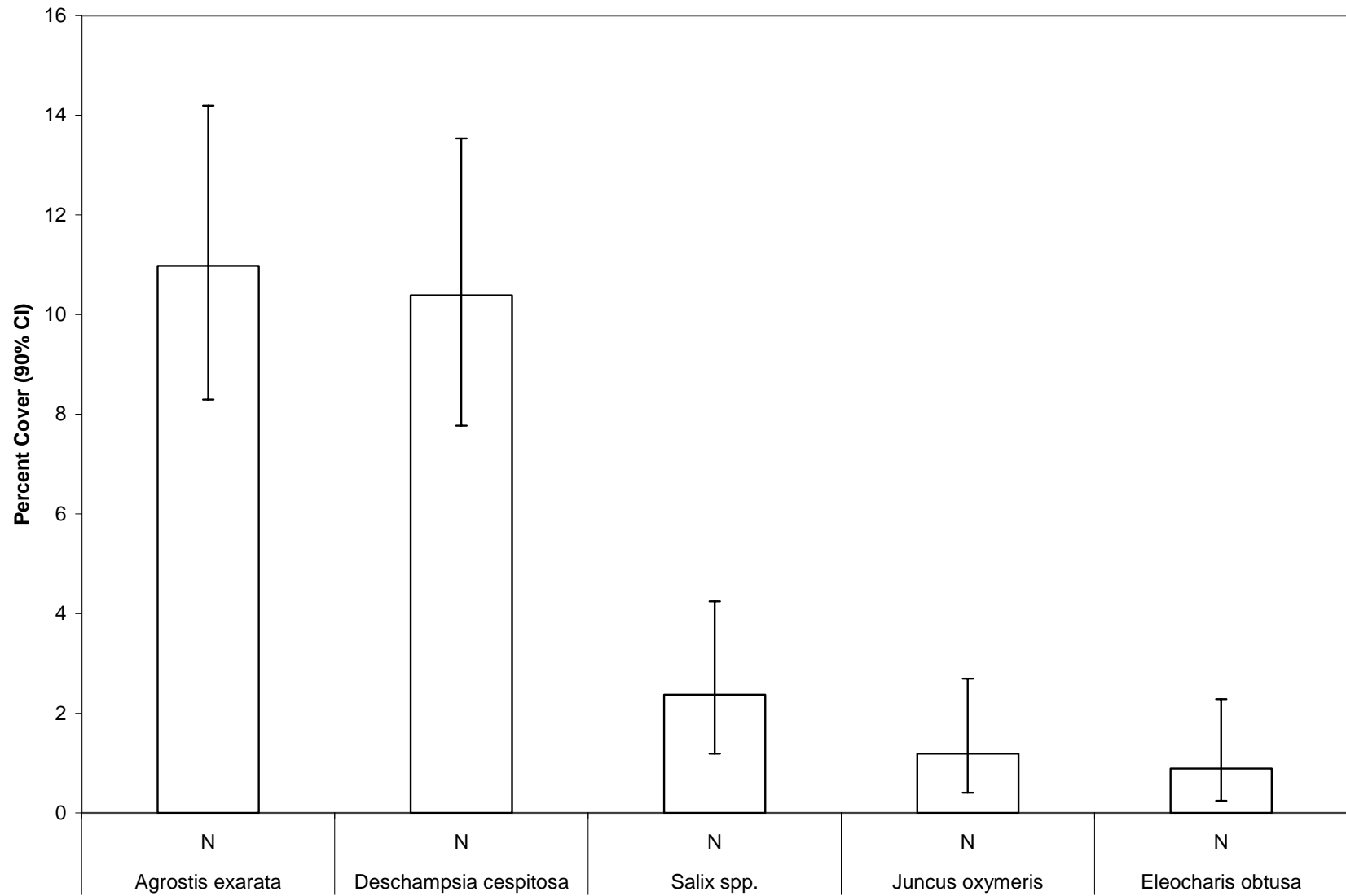


Figure 10.5. Species in the Oxbow West Phase 1 Emergent Restoration and Enhancement area with > 1% cover.
All species in 2005 with greater than one percent cover are graphed for Oxbow West Phase 1 Emergent Restoration and Enhancement area.

Chapter 11. Turtle Swale Unit

A. Site Description

1. Size: 60.5 acres
2. Ownership: BLM
3. Site Timeline:

Table 11.1. Turtle Swale Unit site timeline.

Section	Construction Year	Acreage	Monitoring Period
Phase 1	2001	10.07	2002-2006
Phase 2	2002	11.62	2003-2007
Phase 3	To be determined	To be determined	To be determined

4. Location

Turtle Swale is Unit 1 of the 398 acres of the Lower Amazon Wetland Restoration and Enhancement Project. It occupies the area south of Royal Avenue between the Amazon Diversion Channel and the Amazon Creek in west Eugene, OR.

5. Site History

There have been a variety of past land uses on this site. The eastern tax lot was cultivated for ryegrass. The western tax lot below Turtle Swale appears to have been heavily cultivated. Portions of the site north of the swale were filled with a variety of urban debris and approximately 32,000 cubic yards of fill material. The remainder of this section may have been grazed, but appears not to have been tilled.

6. Focus of Prescriptions

The overall goal for the Turtle Swale Unit is to protect and enhance higher quality areas and their associated populations of rare species, while restoring the highly degraded areas that were historically wet prairie and emergent communities. This will be done by removing existing fill piles, the adjacent channel levees, colonies of reed canarygrass, and restoring the historic swale that runs east to west across the site.

7. Site-Specific Management Goals

1. Restore the emergent areas by eliminating or reducing concentrations of reed canarygrass.
2. Restore the historic swale running east to west across the site for western pond turtle habitat.
3. Protect and enhance the populations of rare plant species on the site. These species include *Aster curtus*, *Lupinus sulphureus* var. *kincaidii*, and *Asclepias fascicularis*.

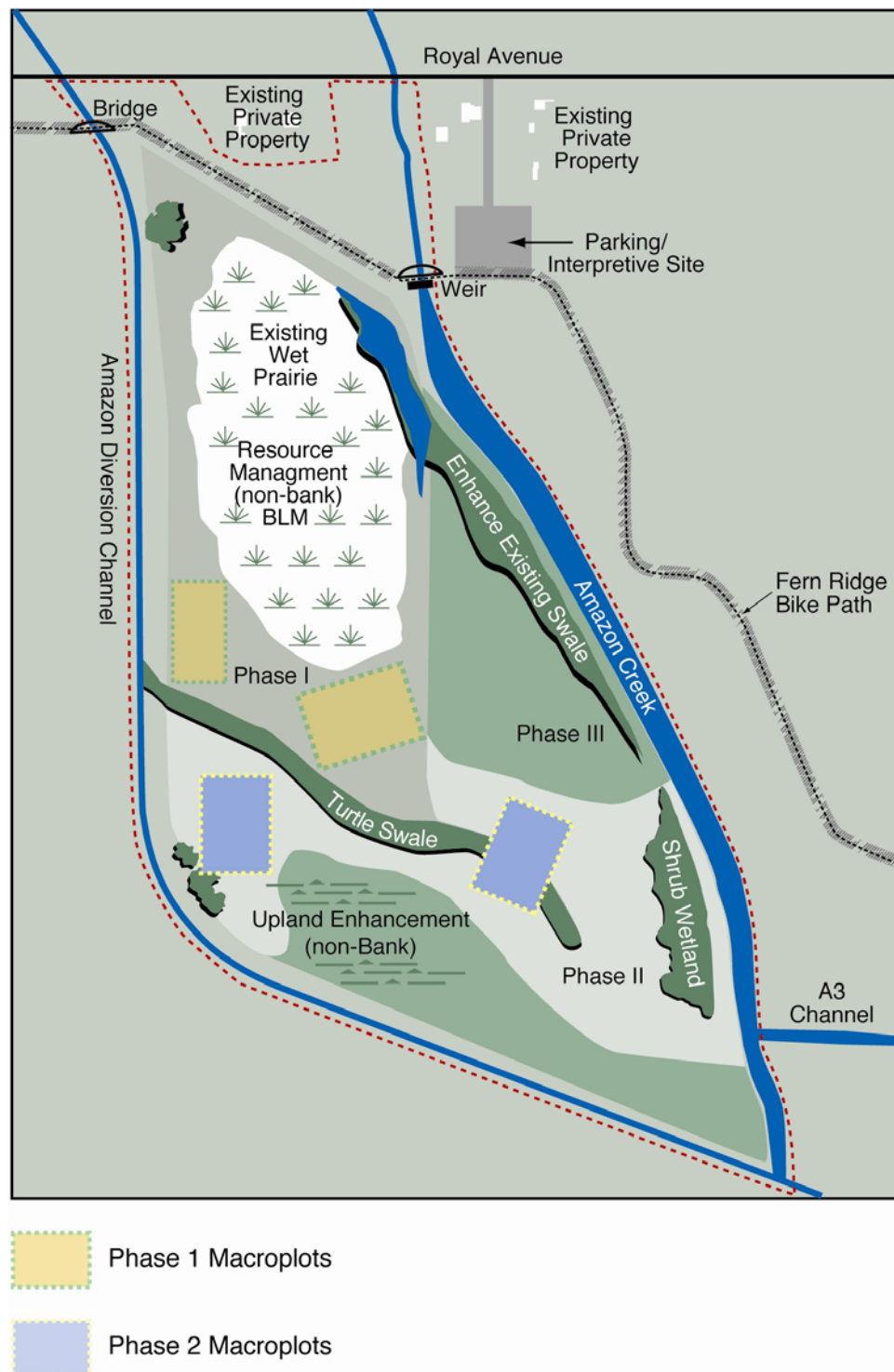


Figure 11.1. Turtle Swale Site Map.

The phases, enhancement areas and pre-existing wet prairie areas are labeled. Community vegetation monitoring macroplots are labeled for phases 1 and 2.

B. 2005 Monitoring Summary

Turtle Swale Phase 1 has met 2nd-year vegetation and hydrology standards. No significant changes were observed this year (year 4).

Turtle Swale Phase 2 has met 2nd-year vegetation and hydrology standards. However, large populations of *Leontodon taraxacoides*, *Hypochaeris radicata*, and *Vulpia bromoides* were treated with solarization and flaming in 2005. No significant hydrology changes were observed this year (year 3).

No formal hydrology or quantitative vegetation data collection were required this year. A species list was updated for each phase and can be viewed in Appendix B.

1. 2005 Management Actions*Phase 1:*

1. Maintenance crews removed reed canarygrass (*Phalaris arundinacea*) and thistle (*Cirsium vulgare* and *C. canadensis*) along the eastern edge
2. The road along the western perimeter was removed and seeded with an aggressive wet prairie seed mix.
3. A Maintenance crew of 4 people spent 11 days removing exotics from the restoration area. The target species included reed canarygrass (*Phalaris arundinacea*), annual ryegrass (*Lolium multiflorum*), six weeks fescue (*Vulpia bromoides*), St. John's wort (*Hypericum perforatum*), and pennyroyal (*Mentha pulegium*).
4. The perimeter was mowed.

Phase 2:

1. Biosolids were applied to a portion of the eastern section to see if it would increase vegetation cover without causing a weed problem.
2. Maintenance crews spent several weeks removing exotics from the restoration area. The main target species included St. John's wort (*Hypericum perforatum*), pennyroyal (*Mentha pulegium*), hairy cat's ear (*Hypochaeris radicata*), common velvet grass (*Holcus lanatus*), tall fescue (*Festuca arundinacea*), common centaury (*Centaurea pratensis*), and non-native bentgrasses (*Agrostis* spp.).
3. The perimeter of the site was mowed.

2. Management Actions for 2006*Phase 1:*

1. Continue to remove reed canarygrass (*Phalaris arundinacea*) and Harding grass (*Phalaris aquatica*).
2. Mow project perimeter.
3. Monitor the vegetation where the haul road was removed in 2005 and schedule weeding as needed. Mow the edge areas to keep teasel and other weedy species from colonizing the area where the road was removed.
4. The area disturbed by the removal of the haul road was seeded with an aggressive wet prairie seed mix (Table 11.2).

Table 11.2. Turtle Swale haul road removal seed mix.

After the haul road was removed, it was seeded with the below seed mix. The table includes the species seeded and the total grams used of each species. The total number of grams used, pounds, and pounds per acre are also listed for each mix.

Habitat	Wet Prairie
Acres	1.25
Species	Weight (g)
<i>Agrostis exarata</i>	1701.0
<i>Deschampsia cespitosa</i>	1701.0
<i>Danthonia californica</i>	1441.0
<i>Beckmannia syzigachne</i>	567.0
<i>Bromus carinatus</i>	567.0
<i>Elymus glaucus</i>	567.0
<i>Downingia elegans</i>	283.0
<i>Epilobium densiflorum</i>	283.0
<i>Plagiobothrys figuratus</i>	283.0
<i>Danthonia californica</i>	260.0
Total grams	7653.0
Total pounds	16.8
Pounds/acre	13.5

5. Remove the culverted “bridge” area near the middle of turtle swale. It’s no longer needed for access and tends to be weedy. Re-seed with aggressive native prairie mix.

Phase 2:

1. Continue to hand weed non-natives from the restoration with a focus on six-weeks fescue, penny royal, and reed canarygrass.
2. Mow project perimeter.
3. The area was seeded with seed mixes of aggressive species in wet prairie, vernal pool, and upland prairie habitats to increase the vegetative cover on the site (Table 11.3).

Table 11.3. Turtle Swale Phase 2 over-seed mixes.

To increase native cover on Turtle Swale Phase 2, 3 seed mixes were spread in wet prairie, vernal pool and upland prairie habitats. The table includes the species seeded and the total grams used of each species. The total number of grams used, pounds, and pounds per acre are also listed for each mix.

Habitat	Wet Prairie	Vernal Pool	Upland Prairie
Acres	3.5	0.5	3.0
Species	Weight (g)	Weight (g)	Weight (g)
<i>Agrostis exarata</i>	805	115	0
<i>Bromus carinatus</i>	0	0	600
<i>Clarkia purpurea</i>	0	0	675
<i>Danthonia californica</i>	0	0	518
<i>Deschampsia cespitosa</i>	1400	200	0
<i>Downingia elegans</i>	0	50	0
<i>Elymus glaucus</i>	0	0	6000

Habitat	Wet Prairie	Vernal Pool	Upland Prairie
Acres	3.5	0.5	3.0
<i>Epilobium densiflorum</i>	1575	225	0
<i>Eriophyllum lanatum</i>	175	0	150
<i>Gnaphalium palustre</i>	0	50	0
<i>Hordeum brachyantherum</i>	0	150	0
<i>Lotus unifolius</i>	350	0	450
<i>Lupinus polyphyllus</i>	146	0	0
<i>Lupinus polyphyllus</i>	29	0	0
<i>Lupinus rivularis</i>	350	0	0
<i>Madia elegans</i>	175	0	0
<i>Madia sativa</i>	105	0	135
<i>Plagiobothrys figuratus</i>	0	338	0
<i>Prunella vulgaris</i>	490	0	0
Total grams	5600	1128	8528
Total pounds	12.35	2.49	18.80
Pounds/acre	3.5	5.0	6.3

- Re-visit the area in spring/summer 2006 to determine if the total cover is improving (was over-seeded in the fall). If not, over-seed again in the fall with a mix of aggressive native forb species to improve cover.
- Continue to observe area where compost was put down in 2005.

Phase 3:

The proposed restoration in this area is currently on hold. In the interim, the goal is to control the spread of seed from this phase into the restorations through mowing.

Remnant Prairies (Non-mitigation Bank Areas):

Central Prairie Area

Continue to selectively remove woody vegetation from this area, focusing on exotics. Start to remove non-native herbaceous species focusing on St. John's wort.

Amazon Creek ("A" Channel)

This area offers good Western pond turtle habitat, which could be improved on by minimizing woody vegetation along the banks and incorporating basking logs.

Remnant prairie (triangular area in southeast corner of site)

Remove pear and other exotic woody species and keep native trees and shrubs from expanding in this area.

Table 11.4. Progress of the Turtle Swale Unit restorations towards meeting the MOA vegetation standards.

The most recent data for each phase is compared to its relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Vegetation Standard in MOA	Phase 1	Goal Met?	Phase 2	Goal Met?
Site status in the monitoring period	2002-2006	N/A	2003-2007	N/A

Vegetation Standard in MOA	Phase 1	Goal Met?	Phase 2	Goal Met?
Hydric soils	Present	Yes	Present	Yes
Wetland hydrology	Present	Yes	Present	Yes
Hydrophytic vegetation	Present	Yes	Present	Yes
50% native cover after 2 years	MP 1 = 97% MP 2 = 91%	Yes	MP 1 = 96% MP 2 = 77%	Yes
70% native cover after 5 years	2006	TBD	2007	TBD
75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list	2006	TBD	2007	TBD
70% of the planted species shall be alive and present at the end of the five year monitoring period	2006	TBD	2007	TBD
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	2006	TBD	2007	TBD
Emergent: min 5 native species occurring at 10% frequency rate or greater	2006	TBD	2007	TBD

3. Wildlife Utilization

The large amount of contiguous habitat of the Lower Amazon Restoration Project, of which Turtle Swale is apart, attracts large numbers and a wide variety of wildlife. Specific sightings for Turtle Swale include killdeer and their nests, redwing blackbirds, green heron, blue heron, mallards, red-tailed hawks, and osprey.

Chapter 12. Willow Corner Unit

A. Site Description

1. **Size:** 6.4 acres
2. **Ownership:** City of Eugene
3. **Site Timeline:**

Table 12.1. Willow Corner Unit site timeline.

Section	Treatment and Construction Years	Acreage	Monitoring Period
Wet Prairie Restoration	2003	6.15	2004-2008
Emergent Enhancement	2003	0.20	2004-2008
Upland Restoration	2003	0.05	2004-2008

4. Location

The Willow Corner Unit is located at the southwestern corner of 18th Avenue and Bertelsen Road. It is bordered to the west and south by land owned by The Nature Conservancy.

5. Baseline Conditions

Historically, the site was likely dominated by wet prairie, with a minor component of upland prairie. However, over the past two decades, large quantities of fill material were dumped and spread out over the area in anticipation of future commercial development. Cottonwood, willows, and Himalayan blackberry grew on top of the fill to make up the majority of the vegetation.

6. Focus of Prescriptions

Approximately 50,000 cubic yards of material was removed from 6.4 acres of land owned by the City of Eugene and approximately 6.5 acres owned by The Nature Conservancy. The area was then planted with appropriate seed mixes and augmented with plugs and bulbs.

7. Site-Specific Management Goals

10. Restore native wet prairie vegetation to areas where fill was removed.
11. Control invasive plant species in areas immediately adjacent to the proposed restoration to prevent their spread into the newly graded areas. This includes reed canarygrass (*Phalaris arundinacea*), harding grass (*Phalaris aquatica*), pennyroyal (*Mentha pulegium*), teasel (*Dipsacus fullonum*), Scot's broom (*Cytisus scoparius*), and Armenian blackberry (*Rubus armeniicus*).
12. Enhance existing wet prairie vegetation by removing exotic species and re-establishing native wet prairie species.
13. Minimize impacts to existing adjacent wetland and upland prairie areas and rare plant populations during restoration and enhancement activities.

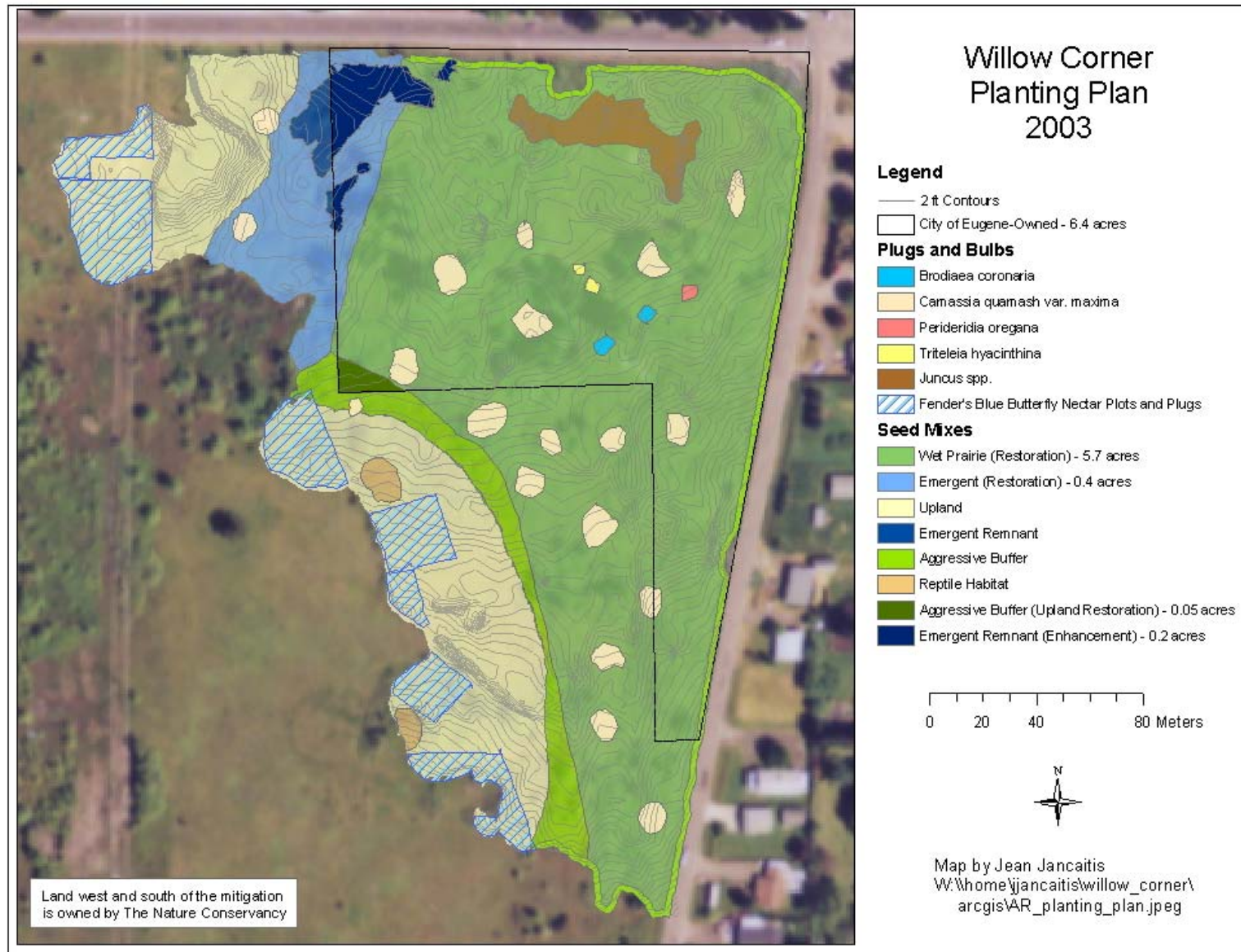


Figure 12.1. Willow Corner Unit – 2003 Project Map and Planting Plan.

The map shows the mitigation, on land owned by the City of Eugene, labeled with the number of acres mitigated. The map also illustrates the planting plan for the entire restoration. No credits will be generated from restoration completed on land owned by The Nature Conservancy.

B. 2005 Monitoring Summary

In 2004 the establishment of wetland hydrology appeared to be on track to meet mitigation bank standards; however, since 2005 had an extremely dry spring, soil pits will need to be retested in 2006 to document wetland hydrology. Sections of the southern panhandle may be upland instead of wet prairie. After a more thorough evaluation, portions of the panhandle may be replanted with upland species.

Vegetation monitoring showed that the mitigation met the 2nd year standard of 50% relative native cover. At Willow Corner, 100% of the vegetation surveyed was native. However, the majority of the total cover (53.5%) was *Deschampsia cespitosa* (48.3%). Remedial action is needed to ensure the site meets the vegetation diversity standards. Action began in late 2005 and included mowing the *Deschampsia cespitosa* to prevent seed set. The site was also seeded with addition forbs (Table 12.2).

1. 2005 Management Actions

1. Over a month was spent hand weeding non-native species from the restoration. Crews focused on *Juncus marginatus* where monocultures were becoming established.
2. The perimeter of the site was mowed.
3. *Mentha pulegium* (penny royal) and non-native trees and shrubs were pulled from the enhancement area.
4. Youth crews pulled *Cytisus scoparius* and *Rubus armeniacus* from the eastern portion of the site.
5. Minor erosion damage on the northern outfall, just west of the parking area, was repaired.
6. There were numerous large cottonwoods growing on the fill before restorations. These have resprouted in the center of the restoration. Most sprouts were mowed several times to prevent their spread.
7. Areas where the *Deschampsia cespitosa* is too thick were mowed twice to prevent seed set.
8. The northern portion of the site was seeded with a mix of aggressive wet prairie forbs to increase forb cover (Table 12.2).

Table 12.2. Willow Corner forb over-seed mix.

The northern portion of the Willow Corner Restoration was seeded with a mixture of aggressive forbs. The table includes the species seeded and the total grams used of each species. The total number of grams used, pounds, and pounds per acre are also listed for each mix.

Habitat	Wet prairie/Vernal Pool
Acres	4
Species	Weight (g)
<i>Epilobium densiflorum</i>	1361.0
<i>Lotus unifoliolatus</i>	54.0
<i>Lupinus rivularis</i>	454.0
<i>Madia elegans</i>	454.0
<i>Madia sativa</i>	100.0
<i>Madia sativa</i>	354.0
<i>Microseris laciniata</i>	454.0
<i>Plagiobothrys figuratus</i>	454.0
<i>Potentilla gracilis</i>	454.0
<i>Prunella vulgaris</i>	454.0
Total grams	3,232.0
Total pounds	7.1
Pounds/acre	1.8

2. Management Actions for 2006

1. Continue to hand weed non-native species from the restoration. Target monocultures of *Juncus marginatus*, *Hypericum perforatum*, and *Mentha pulegium*. Use herbicide where necessary and appropriate.
2. Mow the perimeter of the site.
3. Reseed swales and vernal pools in the northern section of the site.
4. Mowing the cottonwood in the center of the site was intended to prevent its spread. Instead of have the desired effect, mowing appears to have encouraged its spread. Cut and wipe all cottonwood coming up in the center of the site.
5. Remove blackberry along the edge of the site parallel to Bertelsen Road. Mow early summer and then apply herbicide to re-growth in September.
6. Continue to remove non-native woody vegetation from the wetland enhancement area adjacent to West 18th Avenue. Also target this area for pennyroyal removal.
7. Evaluate portions of the site that currently have heavy grass cover. These were overseeded with forbs in fall 2005. Consider mowing and burning to decrease grass and thatch cover.
8. Sections of the southern end of the panhandle appear to be upland. This area will be assessed and reseeded with upland species if appropriate.

Table 12.3. Progress of the Willow Corner Unit Restoration and Enhancement towards meeting the MOA vegetation standards.

The most recent data for each section are compared to their relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Vegetation Standard in MOA	Restoration	Goal Met?
Site status in the monitoring period	2004-2008	N/A
Hydric soils	Present	Yes
Wetland hydrology	Present	Yes
Hydrophytic vegetation	Present	Yes
70% native cover after 5 years	100 %	Yes
75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list	2008	TBD
70% of the planted species shall be alive and present at the end of the five year monitoring period	2008	TBD
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	2008	TBD
Emergent: min 5 native species occurring at 10% frequency rate or greater	2008	TBD

C. Monitoring Results

1. Hydrology

a) Methods

Hydrology monitoring in 2005 included digging soil pits to measure the distance from the soil surface to saturation in early spring and recording inundation levels from one staff gauge throughout the wet season.

b) Results

There were no major changes in the pattern of inundation and saturation across the site that was described in the 2004 Annual Report. The changes observed in the depth of inundation through the wet

season were due to changes in precipitation (Figure 12.2), not changes in the site. Water levels in soil pits were not within 12 inches of the soil surface in late March; however, it was a very dry spring. Soil pit will be retested in the spring of 2006.

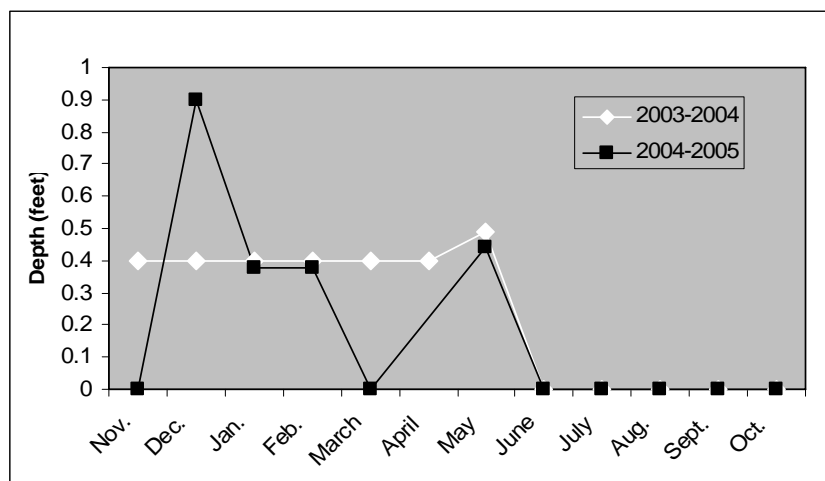


Figure 12.2. Willow Corner inundation levels in the northern section during 2003-2004 and 2004-2005.

Depth of inundation throughout the year in the northern section of Willow Corner in 2003-2004 and 2004-2005.

2. Vegetation

Point-intercept data were collected in one macroplot. The macroplot was sampled on May 26th and 27th of 2005 for a total of 211 points.

A general plant species list for the project was also updated and can be viewed in Appendix B.

a) Results

Data show that the Willow Corner restoration has met the 2nd-year vegetation standards of 50% native species cover (Figure 12.3). Of the total vegetation (53.5%, $47.7\% \leq \mu \leq 59.4\%$), 100% is native. The dominated species was *Deschampsia cespitosa* (48.3%, $42.5\% \leq \mu \leq 54.2\%$). The remaining species detected were all less than 3% cover. Those with greater than 1% cover included *Prunella vulgaris* var. *lanceolata*, *Agrostis exarata*, *Juncus bufonius*, *Juncus ensifolius*, *Epilobium densiflorum*, *Orthocarpus bracteatus*, and *Potentilla gracilis* (Figure 12.4). With the large disparity between the cover of *Deschampsia cespitosa* and native forbs, remedial action will need to take place to meet diversity goals by year 5.

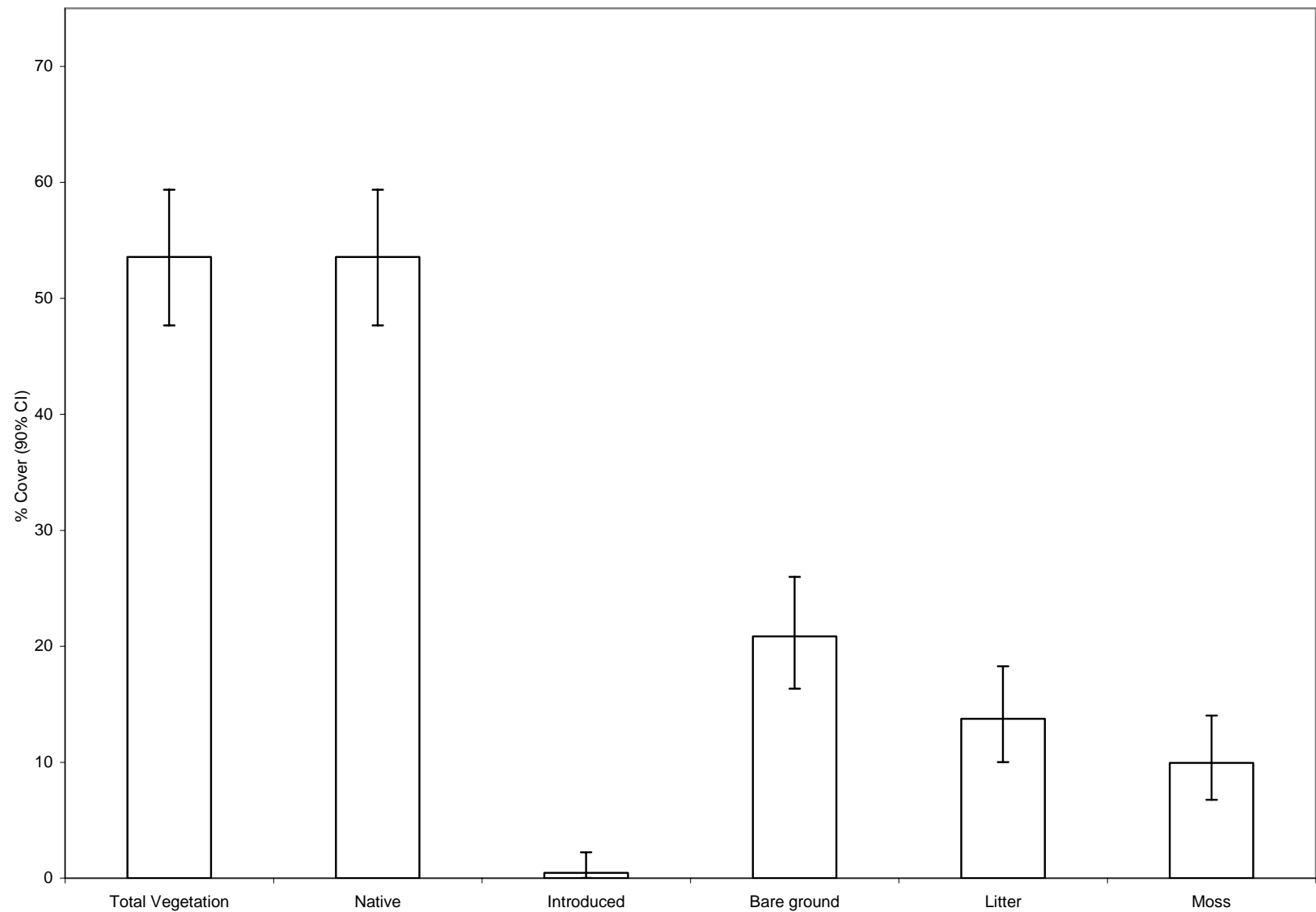


Figure 12.3. Percent cover of ground cover guilds in Macroplots 1 of the Willow Corner restoration.

The total percent cover of all vegetation, native species, introduced species, bare ground, litter and moss are graphed for macroplots 1 of the Willow Corner restoration.

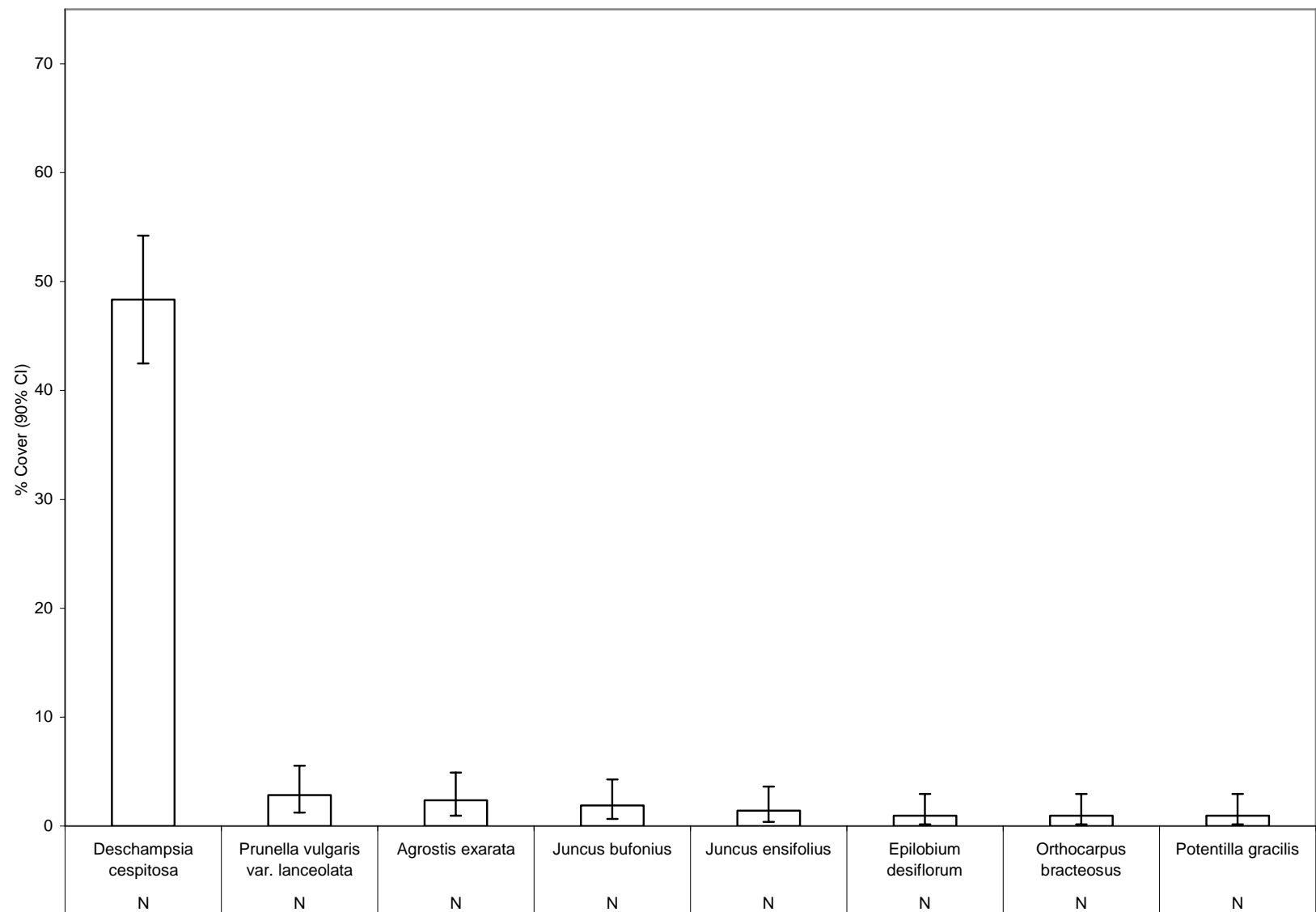


Figure 12.4. **Species in the Willow Corner restoration with > 1% cover.**
All species in 2005 with greater than one percent cover are graphed for Willow Corner restoration.

3. Wildlife Utilization

Evidence of deer and raccoon were observed on the site. A Fender's blue butterfly was observed nectaring in the mitigation on *Plagiobothrys figuratus*.

Appendix A. Monitoring Methods

A. Overview

A mitigation bank monitoring strategy was developed in the spring of 1997 describing mitigation goals and monitoring objectives common to all sites, site-specific goals, and monitoring objectives for existing restoration and enhancement projects. A standard field protocol for qualitative quarterly site monitoring was implemented in the fall of 1997. As new Mitigation Improvement Plans (MIPs) were written, mitigation goals and monitoring objectives were added. Improvements to the protocol were made based on field experiences in 1998. The standard plan and the protocol for quantitative vegetative monitoring were both developed in 1994 (see 1994 Annual Report for details).

A discussion of each type of monitoring is provided in the following sections.

B. Quarterly Monitoring

Photopoints

Purpose: Photos document surface hydrology and vegetation structure. Photos are taken pre- and post-treatment to show landscape level changes.

Method:

- Permanent photostations are established with metal stakes in a sufficient number to provide photo coverage of most restored and enhanced areas at all current sites.
- Photographs are taken pre- and post-project and documented by photopoint number and compass bearing (and landmarks).

Hydrology

Purpose: Assess whether wetland hydrology is established within the restoration site. The extent of soil saturation during the growing season (March 18 – November 26) is an important factor in establishment and growth of hydrophytic vegetation.

Method:

1. Quarterly site visits during the fall, winter, and spring include a brief description of the location, extent, and depth of standing water at each site.
2. The timing of the quarterly visits in the fall and spring should correspond with the beginning and end of the growing season, if possible.
3. The winter visit should document the maximum standing water depth and extent in emergent pools.
4. Water depth is recorded monthly beginning in October and running through May from the 1 or 2 staff gauges installed at most sites.

C. Vegetation Monitoring

Overall Goal: Assess the establishment of hydrophytic vegetation within restoration sites and monitor the status of hydrophytic vegetation in enhancement sites.

Species Lists

Purpose: Assess the status of each site in meeting the following Bank MOA performance standard: The standard reads that, “At least 70 percent of the planted or seeded native plants shall be present at the end of the five year monitoring period.”

Method:

1. The species list should be collected once early in the growing season (late May to mid-June) and once late in the growing season (early to mid-August).
2. A species list is compiled by thoroughly walking through a site while filling out the species checklist.

Seed Assessments

Purpose: To provide and early qualitative assessment of seeding success.

Method:

1. The assessment should take place once early in the growing season (late May to mid-June) and once late in the growing season (early to mid-August).
2. Each native species is noted, while also recording whether its presence in the restoration is 'Dominant,' 'Common,' 'Uncommon,' or present only in 'Trace' amounts."

Point-intercept Sampling

Purpose: To address the performance criteria for species importance in wetland restorations given in the MOA as: "...the restored wetland shall be dominated by native plant species where their total represents at least 50% cover after 2 years and 70% cover 5 years."

Method:

1. The area (or areas) chosen to represent the site's progress are delineated by a macroplot (or macroplots) that are sample in the 2nd and 5th years.
2. The sampling method within each macroplot is referred to as systematic sampling with a random start.
 - a. The maximum point spacing is computed to fit 200 points (explained below in number 3) in each macroplot.
 - b. One side of the macroplot is chosen as the baseline (X), from which transects are run at 90 degrees (Y). The location of the first transect along the baseline is chosen randomly from between 0 and 5 m, while the first sampling location along the Y axis is also selected randomly from between 0 and 4 m.
3. Each observation (or point) is obtained by lowering a vertical cylindrical metal rod with a sharp pin at the tip to note which species are covering the ground at that location.
4. The habitat type of each point is also noted (emergent, vernal pool, *Deschampsia cespitosa* dominated wet prairie, side slope, or old field).
5. The percentage of ground covered by each species is calculated by dividing the total number of observations of each plant by the total number of points. Cover estimates are given with 90% binomial confidence intervals.

Frequency Sampling

Purpose: To assess the progress of each site in meeting the Bank MOA performance standard on species type, which states that, "Of the plant species occurring at a 50% frequency rate or greater, at least 75% shall be from the Native Plant list of the West Eugene Wetlands Plan." These data are also used to assess the site's progress on the diversity and structure goals for wet prairie and emergent habitats. A minimum of 10 native species should occur at 10% frequency rate or greater in wet prairie, while a minimum of 5 native species should occur at a 10% frequency rate or greater in emergent habitats.

Method:

1. Macroplot setup and sampling are similar to the point-intercept methods; however, only 100 observations are required.
2. Each observation consists of noting the presence of each species in a 1 x 1m frame.

3. To obtain the frequency value for each species, the number of times a species is observed within the frame is divided by the total number of frames observed (100). Frequency estimates are also reported with 90% binomial confidence intervals.

Line-intercept Sampling

Purpose: To assess the progress of each site in meeting goals of woody vegetation removal for enhancement areas. For these site-specific goals, refer to the MIP for the enhancement of interest.

Method:

1. The line-intercept method is utilized for estimating the percent cover of shrubs in an enhancement area.
2. Transects are run perpendicular to the macroplot baseline. The segments of the transect that are covered by shrubs are recorded.
3. The percent cover of each shrub species is computed by dividing the length of all transects covered by that species by the combined length of all the transects.

Rare Plant Census

Purpose: To monitor the population changes of the rare and endangered species on Bank enhancement areas. Where applicable, these data will also be used to assess the effects of management actions on the populations of rare species.

Methods for *Erigeron decumbens* var. *decumbens*, *Lomatium bradshawii*, and *Horkelia congesta* ssp. *congesta*:

1. Macroplots were delineated around the entire populations of these rare species where they occur. The macroplot is divided into 1m² plots, and all plots are sampled.
2. The total number of crowns (plants > 3.5 cm apart), flowers, and reproductive crowns are recorded for *Erigeron decumbens* var. *decumbens*. The total number of crowns, flowering stems per crown, and reproductive crowns are recorded for *Horkelia congesta* ssp. *congesta*. For *Lomatium bradshawii*, the total number of plants, leaves and flowering stalks are counted.

Methods for *Aster curtus*:

All populations at Oxbow West and Balboa

1. Each population is marked by a rebar placed approximately in the center of the populations.
2. The total number of ramets is obtained by dividing the populations into sections and counting all individuals in each section.

Populations that fall within macroplots for other rare species (North Greenhill Ash Grove and Balboa)

1. The macroplot is divided into 1m² plots, and all plots are sampled.
2. The presence or absence of *Aster curtus* is noted in each plot. The frequency of *Aster curtus* is obtained for each macroplot. (The total number of ramets is not obtained.)

Methods *Lupinus sulphureus* ssp. *kincaidii*:

1. Macroplots were delineated around the entire population. The macroplot is divided into 1m² plots, and all plots are sampled.
2. The total number of leaves and inflorescences are tallied for the macroplot by counting them in each plot.

Wildlife Surveys

Purpose: To document wildlife usage in restoration and enhancement sites.

Method: Volunteers and the wetland staff make note of wildlife sightings as they occur

Appendix B. Species Lists for all Mitigation Bank Sites.

The species observed on each site are recorded by noting the section of the restoration or enhancement area in which they were found.

Scientific Name	Common Name	Site	Balboa	Dragonfly Bend	Nolan		North Greenhill				Oxbow West				Turtle Swale		Willow Corner
		Phase	1	1	1	1	2	2	3	3	1	1	1	1	1	2	1
		Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
<i>Acer macrophyllum</i>	bigleaf maple	N															
<i>Achillea millefolium</i>	yarrow	N	X														
<i>Agrostis exarata</i>	spike bentgrass	N	X	X	X	X	X	X	X		X	X		X	X	X	X
<i>Agrostis stolonifera/capillaris</i>	florin (bentgrass)	I	X		X	X		X	X	X	X	X	X	X	X	X	X
<i>Aira caryophyllea</i>	silver hairgrass	I	X		X	X	X	X	X		X	X	X		X	X	X
<i>Alisma lanceolatum</i>	narrowleaf waterplantain	I								X				X			
<i>Alisma trivale</i>	northern waterplantain	N	X	X	X	X	X		X						X	X	X
<i>Allium amplexens</i>	slimleaf onion	N	X								X	X	X				
<i>Alnus rubra</i>	red alder	N															
<i>Alopecurus geniculatus</i>	water foxtail	I		X	X	X				X	X	X	X	X	X	X	X
<i>Alopecurus pratensis</i>	meadow foxtail	I			X	X	X	X			X	X				X	
<i>Amelanchier alnifolia</i>	western serviceberry	N	X								X		X				X
<i>Anagallis arvensis</i>	scarlet pimpernel	I					X							X			X
<i>Anaphalis margaritacea</i>	pearly-everlasting	N															
<i>Anthemis cotula</i>	mayweed chamomile	I															X
<i>Anthoxanthum odoratum</i>	sweet vernalgrass	I	X		X	X	X		X		X	X	X				X
<i>Anthriscus caucalis</i>	bur-chervil	I															
<i>Arrhenatherum elatius</i>	tall oatgrass	I															
<i>Aster curtus</i>	rigid white topped aster	N											X				
<i>Aster hallii</i>	Hall's aster	N	X	X					X	X	X	X	X		X	X	X
<i>Avena fatua</i>	wild oat	I															
<i>Baccharis pilularis</i>	coyote brush	N															
<i>Barbarea orthoceras</i>	wintercress	N															
<i>Beckmannia syzigachne</i>	American sloughgrass	N	X	X	X	X			X	X	X			X	X	X	X
<i>Berberis aquifolium</i>	tall Oregon grape	N															
<i>Bidens cernua</i>	nodding beggars-tick	N															
<i>Bidens frondosa</i>	leafy beggars-tick	N	X											X		X	X
<i>Brassica campestris</i>	field mustard	I															
<i>Briza minor</i>	little quaking-grass	I	X		X	X	X	X	X			X	X		X	X	X
<i>Brodiaea coronaria</i>	harvest brodiaea	N	X										X				
<i>Bromus carinatus</i>	California brome	N															
<i>Bromus hordeaceus</i>	soft brome	I			X					X							
<i>Bromus rigidus</i>	ripgut brome	I												X			

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			Phase	1	1	1	1	2	2	3	3	1	1	1	1	1	2	1
			Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
<i>Bromus sitchensis</i>	sitka brome	N																
<i>Calandrinia ciliata</i>	red maids	N																
<i>Callitriche heterophylla</i>	water starwort	N																
<i>Callitriche stagnalis</i>	pond water-starwort	I																
<i>Calochortus uniflorus</i>	large flowered star tulip	N	X															
<i>Camassia leichtlinii</i>	tall camas	N	X										X	X		X	X	
<i>Camassia quamash</i>	common camas	N	X									X		X		X	X	X
<i>Cardamine oligosperma</i>	little western bittercress	N																
<i>Cardamine penduliflora</i>	Willamette V. bittercress	N																
<i>Carex densa</i>	dense sedge	N	X	X	X		X			X		X	X	X		X	X	X
<i>Carex echinata</i>	muricate sedge	N																
<i>Carex feta</i>	green-sheath sedge	N								X			X			X		X
<i>Carex lanuginosa</i>	wooly sedge	N																
<i>Carex obnupta</i>	slough sedge	N		X											X	X		X
<i>Carex ovalis</i>	hare sedge	I	X			X	X					X	X	X		X		
<i>Carex sp.</i>	sedge	N	X	X											X			X
<i>Carex stipata</i>	sawbeak sedge	N																
<i>Carex tumulicola</i>	foothill sedge	N																
<i>Carex unilateralis</i>	one-sided sedge	N	X	X	X	X				X	X	X	X		X	X	X	X
<i>Castilleja tenuis</i>	hairy owl-clover	N		X		X		X		X		X				X	X	X
<i>Centaureum erythraeae</i>	common centaury	I	X			X	X	X	X	X		X	X	X		X	X	X
<i>Centaureum muhlenbergii</i>	monterey centaury	N					X					X	X	X			X	X
<i>Centunculus minimus</i>	chaffweed	N		X														X
<i>Cerastium glomeratum</i>	sticky chickweed	I	X			X						X	X	X	X	X	X	X
<i>Chamomilla suaveolens</i>	pineapple weed	N																
<i>Cicendia quadrangularis</i>	Timwort	N					X	X		X								X
<i>Cichorium intybus</i>	chicory	I																
<i>Cirsium arvense</i>	Canada thistle	I		X	X	X					X						X	X
<i>Cirsium vulgare</i>	bull thistle	I	X	X								X						X
<i>Convolvulus arvensis</i>	bindweed	I													X			
<i>Crataegus monogyna</i>	English hawthorn	I	X	X								X	X	X				X
<i>Crataegus suksdorfii</i>	black hawthorn	N	X			X	X					X	X	X	X	X		X
<i>Crataegus suksdorfii X monogyna</i>	Hybrid hawthorn	I	X	X								X	X	X	X	X	X	X
<i>Cuscuta sp.</i>	dodder																	
<i>Cynosurus cristatus</i>	crested dogtail	I																X

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		Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
<i>Cynosurus echinatus</i>	hedgehog dogtail	I	X			X					X		X				
<i>Cyperus acuminatus</i>	short-pointed flatsedge	N															
<i>Cyperus eragrostis</i>	tall flatsedge	I													X		
<i>Cyperus squarrosus</i>	awned flatsedge	N															
<i>Cytisus scoparius</i>	broom	I	X												X		X
<i>Dactylis glomerata</i>	orchard-grass	I															
<i>Danthonia californica</i>	California oatgrass	N	X			X	X		X		X	X	X		X	X	X
<i>Daucus carota</i>	Queen Anne's lace	I	X	X	X					X		X	X			X	X
<i>Delphinium menzeisii</i>	Menzies' larkspur	N															
<i>Deschampsia cespitosa</i>	tufted hairgrass	N	X	X	X	X	X	X	X		X	X	X	X	X	X	X
<i>Deschampsia danthonioides</i>	annual hairgrass	N					X			X					X	X	
<i>Deschampsia elongata</i>	slender hairgrass	N															
<i>Dianthus armeria</i>	Deptford pink	I															X
<i>Dichanthelium acuminatum</i> var. <i>fasciculatum</i>	western witchgrass	N	X				X		X				X			X	X
<i>Dipsacus fullonum</i>	teasel	I				X		X			X		X		X		X
<i>Downingia elegans</i>	showy downingia	N	X	X	X	X				X			X	X	X	X	X
<i>Downingia yina</i>	Willamette downingia	N		X		X			X					X		X	X
<i>Echinochloa crus-galli</i>	large barnyard-grass	I		X	X												
<i>Eleocharis acicularis</i>	needle spike-rush	N													X		
<i>Eleocharis obtusa</i>	common spike-rush	N	X	X	X	X				X				X	X	X	
<i>Eleocharis palustris</i>	common spikerush	N	X	X	X	X				X				X	X		X
<i>Eleocharis quadrangulata</i>	squarestem spikerush	N	X														
<i>Elymus glaucus</i>	blue wildrye	N															X
<i>Epilobium brachycarpum</i>	autumn willowherb	N	X	X	X	X			X	X	X	X	X	X	X	X	X
<i>Epilobium ciliatum</i>	hairy willowherb	N	X	X	X		X				X	X	X	X		X	X
<i>Epilobium densiflorum</i>	dense spike-primrose	N	X	X	X	X		X	X	X	X		X	X	X	X	X
<i>Epilobium pygmaeum</i>	smooth willowherb	N			X	X				X					X		
<i>Equisetum</i> sp.	horsetail	N															
<i>Eriophyllum lanatum</i>	wooly sunflower	N	X	X	X	X	X		X		X	X	X		X	X	X
<i>Eryngium</i>	coyote thistle	N	X	X	X	X	X		X	X			X	X	X	X	X

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		Phase	1	1	1	1	2	2	3	3	1	1	1	1	1	2	1
		Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
<i>petiolatum</i>																	
<i>Festuca arundinacea</i>	tall fescue	I	X		X	X	X	X	X		X	X	X	X			X
<i>Fragaria virginiana</i>	strawberry	N	X														
<i>Fraxinus latifolia</i>	Oregon ash	N	X	X	X	X					X	X	X	X			
<i>Galium aparine</i>	catchweed	I										X					
<i>Galium parisiense</i>	wall bedstraw	I	X									X					X
<i>Galium trifidum</i>	small bedstraw	N		X		X						X					X
<i>Galium triflorum</i>	sweet scented bedstraw	N															
<i>Gentiana sceptrum</i>	staff gentian	N															
<i>Geranium dissectum</i>	cut-leaved geranium	I	X		X	X	X	X			X	X		X	X	X	X
<i>Geranium spp.</i>	geranium	I															
<i>Geum macrophyllum</i>	Oregon avens	N															
<i>Glyceria occidentalis</i>	western manna grass	N		X	X	X			X	X					X	X	X
<i>Gnaphalium palustre</i>	lowland cudweed	N		X	X	X								X		X	X
<i>Gnaphalium purpureum</i>	purple cudweed	I							X								X
<i>Gnaphalium uliginosum</i>	marsh cudweed	I															
<i>Gnaphalium stramineum</i>	cotton batting cudweed	N		X													
<i>Gratiola ebracteata</i>	bractless hedge-hyssop	N	X	X	X	X	X		X			X	X	X	X	X	X
<i>Grindelia integrifolia</i>	Willamette V. gumweed	N	X	X	X	X	X		X				X		X	X	X
<i>Heracleum lanatum</i>	cow parsnip	N									X		X				
<i>Heterocodon rariflorum</i>	heterocodon	N															
<i>Holcus lanatus</i>	velvet grass	I	X		X	X	X	X	X		X	X	X	X	X	X	X
<i>Hordeum brachyantherum</i>	meadow barley	N			X	X	X		X		X			X	X	X	X
<i>Hordeum geniculatum</i>	Mediterranean barley	I															
<i>Hypericum anagalloides</i>	bog or trailing St. John's-wort	N															
<i>Hypericum perforatum</i>	St. John's-wort	I	X	X			X		X		X	X	X	X	X	X	X
<i>Hypochaeris radicata</i>	false dandelion	I	X	X	X	X	X		X		X	X	X	X	X	X	X
<i>Isoetes nutalli</i>	Nuttall's quillwort	N															
<i>Isoetes sp.</i>	quillwort	N															
<i>Juncus acuminatus</i>	tapered rush	N	X	X	X	X			X	X	X	X		X	X	X	X
<i>Juncus articulatus</i>	jointed rush	N															
<i>Juncus bolanderi</i>	Bolander's rush	N	X	X					X					X	X	X	X
<i>Juncus bufonius</i>	toad rush	N	X	X		X			X	X		X	X	X	X	X	X
<i>Juncus effusus</i>	soft rush	N		X		X							X	X	X	X	X

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			Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
	<i>Juncus ensifolius</i>	swordleaf rush	N	X	X	X				X	X				X	X		X
	<i>Juncus marginatus</i>	grass-leaf rush	I												X			X
	<i>Juncus nevadensis</i>	Nevada rush	N	X	X						X			X			X	
	<i>Juncus oxymeris</i>	pointed rush	N	X	X	X					X				X	X	X	X
	<i>Juncus patens</i>	spreading rush	N		X		X			X		X	X			X	X	X
	<i>Juncus tenuis</i>	slender rush	N	X		X	X	X	X	X		X	X	X	X	X	X	X
	<i>Kickxia elatine</i>	cancerwort	I															X
	<i>Koeleria cristata</i>	prairie junegrass	N															
	<i>Lactuca saligna</i>	willow lettuce	I		X	X												X
	<i>Lactuca serriola</i>	prickly lettuce	I		X													X
	<i>Lamium purpureum</i>	red dead-nettle	I															
	<i>Lasthenia glaberrima</i>	smooth lasthenia	N			X	X	X		X						X	X	X
	<i>Lathyrus aphaca</i>	yellow vetch	I															
	<i>Lathyrus latifolius</i>	everlasting pea	I															
	<i>Lathyrus sphaericus</i>	grass pea-vine	I													X	X	X
	<i>Leersia oryzoides</i>	cutgrass	N															
	<i>Leontodon taraxacoides</i>	hairy hawkbit	I	X	X		X	X		X		X	X	X	X	X	X	X
	<i>Lepidium sp.</i>	peppergrass																
	<i>Leucanthemum vulgare</i>	oxeye daisy	I	X				X		X			X	X		X	X	X
	<i>Lindernia anagallidea</i>	false-pimpernel	N															
	<i>Linum bienne</i>	pale flax	I	X						X		X	X	X		X	X	X
	<i>Lolium multiflorum</i>	Italian ryegrass	I		X			X								X	X	X
	<i>Lolium perenne</i>	perennial ryegrass	I															
	<i>Lomatium nudicaule</i>	barestem desert-parsley	N		X			X		X						X		X
	<i>Lonicera hispidula</i>	hairy honeysuckle	N															
	<i>Lotus corniculatus</i>	bird'sfoot trefoil	I									X			X	X	X	X
	<i>Lotus formosissimus</i>	seaside lotus	N	X				X		X		X	X	X	X	X	X	X
	<i>Lotus micranthus</i>	small-flowered deervetch	N					X		X						X	X	
	<i>Lotus pinnatus</i>	meadow deervetch	N															
	<i>Lotus unifoliolatus</i>	Spanish-clover	N	X	X	X	X	X	X	X		X	X	X	X	X	X	X
	<i>Ludwigia palustris</i>	water purslane	N		X						X					X		X
	<i>Lupinus bicolor</i>	field lupine	N			X										X	X	X
	<i>Lupinus polyphyllus</i>	bigleaf lupine	N	X														X
	<i>Lupinus rivularis</i>	stream lupine	N	X	X			X		X					X	X	X	X
	<i>Luzula comosa</i>	field woodrush	N	X						X				X				X
	<i>Lysimachia nummularia</i>	moneywort	I															
	<i>Lythrum hyssopifolia</i>	hyssop loosestrife	I		X		X											X

Appendix B. Species Lists for all Mitigation Bank Sites.

The species observed on each site are recorded by noting the section of the restoration or enhancement area in which they were found.

Scientific Name	Common Name	Site	Balboa	Dragonfly Bend	Nolan		North Greenhill				Oxbow West				Turtle Swale		Willow Corner
		Phase	1	1	1	1	2	2	3	3	1	1	1	1	1	2	1
		Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
<i>Lythrum portula</i>	water-purslane	I		X	X									X	X	X	
<i>Lythrum salicaria</i>	purple loosestrife	I															
<i>Madia elegans</i>	showy tarweed	N												X	X	X	X
<i>Madia glomerata</i>	cluster tarweed	N			X	X	X		X		X	X	X	X	X	X	X
<i>Madia sativa</i>	coast tarweed	N	X	X		X			X					X	X	X	X
<i>Malus fusca</i>	western crab-apple	N									X						
<i>Melilotus alba</i>	white sweetclover	I					X										
<i>Mentha pulegium</i>	pennyroyal	I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Mentha spicata</i>	spearmint	I															X
<i>Microseris laciniata</i>	cut-leaved microseris	N	X	X		X	X		X	X			X	X	X	X	X
<i>Mimulus guttatus</i> <i>var. depauperatus</i>	depauperate monkeyflower	N															X
<i>Moenchia erecta</i>	moenchia	I	X				X		X				X				
<i>Montia fontana</i>	water chickweed	N															
<i>Montia linearis</i>	narrow-leaved montia	N			X	X	X		X		X	X	X		X		
<i>Myosotis discolor</i>	yellow & blue forget me not	I	X		X	X						X	X	X			X
<i>Myosotis laxa</i>	small-flowered forget me not	N	X	X	X						X	X					X
<i>Myosotis verna</i>		N															
<i>Myosurus minimus</i>	least mouse-tail	N															
<i>Navarretia intertexta</i>	needle-leaved navarretia	N		X	X	X	X		X	X		X		X	X	X	X
<i>Navarretia squarrosa</i>	skunkweed	N															X
<i>Nemophila menziesii</i>	baby blue eyes	N															
<i>Nemophila parviflora</i>	small flower nemophila	N															
<i>Oenamthe sarmentosa</i>	Pacific water-parsley	N															
<i>Orthocarpus bracteatus</i>	rosy owl-clover	N		X			X		X	X					X	X	X
<i>Orobancha californica</i> ssp. <i>californica</i>	California broomrape	N											X				
<i>Panicum capillare</i>	common witchgrass	N	X									X	X		X	X	
<i>Parentucellia viscosa</i>	yellow parentucellia	I	X	X	X	X	X	X	X		X	X	X	X	X	X	X
<i>Perideridia gairdneri</i>	yampah or false-caraway	N															
<i>Perideridia oregana</i>	Oregon yampah	N	X								X		X				
<i>Phalaris aquatica</i>	Harding grass	I			X	X								X			X
<i>Phalaris arundinacea</i>	reed canarygrass	I	X		X	X					X		X	X	X	X	

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		Phase	1	1	1	1	2	2	3	3	1	1	1	1	1	2	1
		Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
<i>Phleum pratense</i>	timothy	I			X												
<i>Phlox gracilis</i>	pink microsteris	N	X				X		X		X	X	X		X	X	X
<i>Physocarpus capitatus</i>	Pacific ninebark	N															
<i>Pinus ponderosa</i>	ponderosa pine	N															
<i>Plagiobothrys figuratus</i>	fragrant popcorn-flower	N	X	X	X	X	X		X		X	X	X	X	X	X	X
<i>Plagiobothrys scouleri</i>	Scouler's popcorn-flower	N		X													
<i>Plantago lanceolata</i>	English plantain	I	X										X			X	X
<i>Plantago major</i>	common plantain	I															
<i>Plectritis congesta</i>	rosy plectritis	N															
<i>Poa annua</i>	annual bluegrass	I															X
<i>Poa compressa</i>	Canada bluegrass	I															
<i>Poa triviale</i>	Kentucky bluegrass	I															
<i>Polygonum aviculare</i>	doorweed	I															X
<i>Polygonum douglasii</i>	douglas knotweed	N															X
<i>Polygonum hydropiperoides</i>	marshpepper smartweed	N															
<i>Polygonum persicaria</i>	heartweed	I		X	X					X							X
<i>Polypogon monspeliensis</i>	rabbitfoot polypogon	I															
<i>Polystichum munitum</i>	western swordfern	N															
<i>Populus trichocarpa</i>	black cottonwood	N			X					X			X		X		X
<i>Potentilla gracilis</i>	slender cinquefoil	N	X	X			X		X	X	X	X	X		X	X	X
<i>Prunella vulgaris</i>	self-heal	N	X	X	X	X	X		X		X	X	X	X	X	X	X
<i>Prunus sp.</i>	"Thundercloud" plum	I	X								X		X				
<i>Pseudotsuga menziesii</i>	Douglas-fir	N															
<i>Psilocarphus spp.</i>	wooly heads	N												X		X	X
<i>Pyrrocampa racemosa</i>	racemed goldenweed	N					X								X		
<i>Pyrus communis</i>	pear	I	X								X	X					
<i>Pyrus malus</i>	apple	I															
<i>Quercus garryana</i>	Oregon white oak	N															
<i>Quercus kelloggii</i>	California black oak	N															
<i>Ranunculus alismaefolius</i>	water-plantain buttercup	N															X

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		Phase	1	1	1	1	2	2	3	3	1	1	1	1	1	2	1
		Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
<i>Ranunculus aquatilis</i>	white water buttercup	N										X				X	
<i>Ranunculus flammula</i>	creeping buttercup	N															X
<i>Ranunculus occidentalis</i>	western buttercup	N					X		X						X	X	X
<i>Ranunculus orthorhynchus</i>	straight beaked buttercup	N	X	X	X	X	X		X		X				X	X	X
<i>Ranunculus repens</i>	creeping buttercup	I															
<i>Ranunculus sceleratus</i>	celery-leaf butter-cup	N		X													
<i>Ranunculus uncinatus</i>	little buttercup	N	X														
<i>Rhamnus purshiana</i>	cascara	N									X		X				
<i>Rorippa curvisiliqua</i>	western yellowcress	N		X	X	X	X		X						X	X	X
<i>Rorippa nasturtium-aquaticum</i>	watercress	N															
<i>Rosa eglanteria</i>	sweetbriar	I	X														
<i>Rosa multiflora</i>	many flowered rose	I	X								X						X
<i>Rosa nutkana</i>	Nootka rose	N	X				X				X	X	X	X	X	X	X
<i>Rosa pisocarpa</i>	peafruit rose	I															
<i>Rubus armeniacus</i>	Himalayan blackberry	I	X	X		X	X		X		X	X	X	X	X	X	X
<i>Rubus laciniatus</i>	evergreen blackberry	I	X								X	X					X
<i>Rubus ursinus</i>	Pacific blackberry	N															
<i>Rumex acetocella</i>	sheep sorrel	I	X	X			X		X			X	X		X	X	X
<i>Rumex conglomeratus</i>	clustered dock	I															
<i>Rumex crispus</i>	curly dock	I	X	X	X	X	X				X	X			X	X	X
<i>Rumex salicifolius</i>	willow dock	N		X											X	X	X
<i>Salix geeyeriana</i>	Geyer willow	N															
<i>Salix hookeriana</i>	Hooker willow	N															
<i>Salix lasiandra</i>	Pacific willow	N															
<i>Salix piperi</i>	Piper's willow	N															
<i>Salix scouleriana</i>	Scouler willow	N															
<i>Salix sessilifolia</i>	Northwest willow	N															
<i>Salix sitchensis</i>	Sitka willow	N															
<i>Salix sp.</i>	willow			X	X	X	X					X		X			X
<i>Sanicula sp.</i>	sanicle																
<i>Sanquisorba occidentalis</i>	annual burnet	N															
<i>Saxifraga integrifolia</i>	swamp saxifrage	N	X	X							X	X	X				
<i>Saxifraga oregana</i>	bog saxifrage	N										X	X				
<i>Scirpus americanus</i>	bulrush	N															

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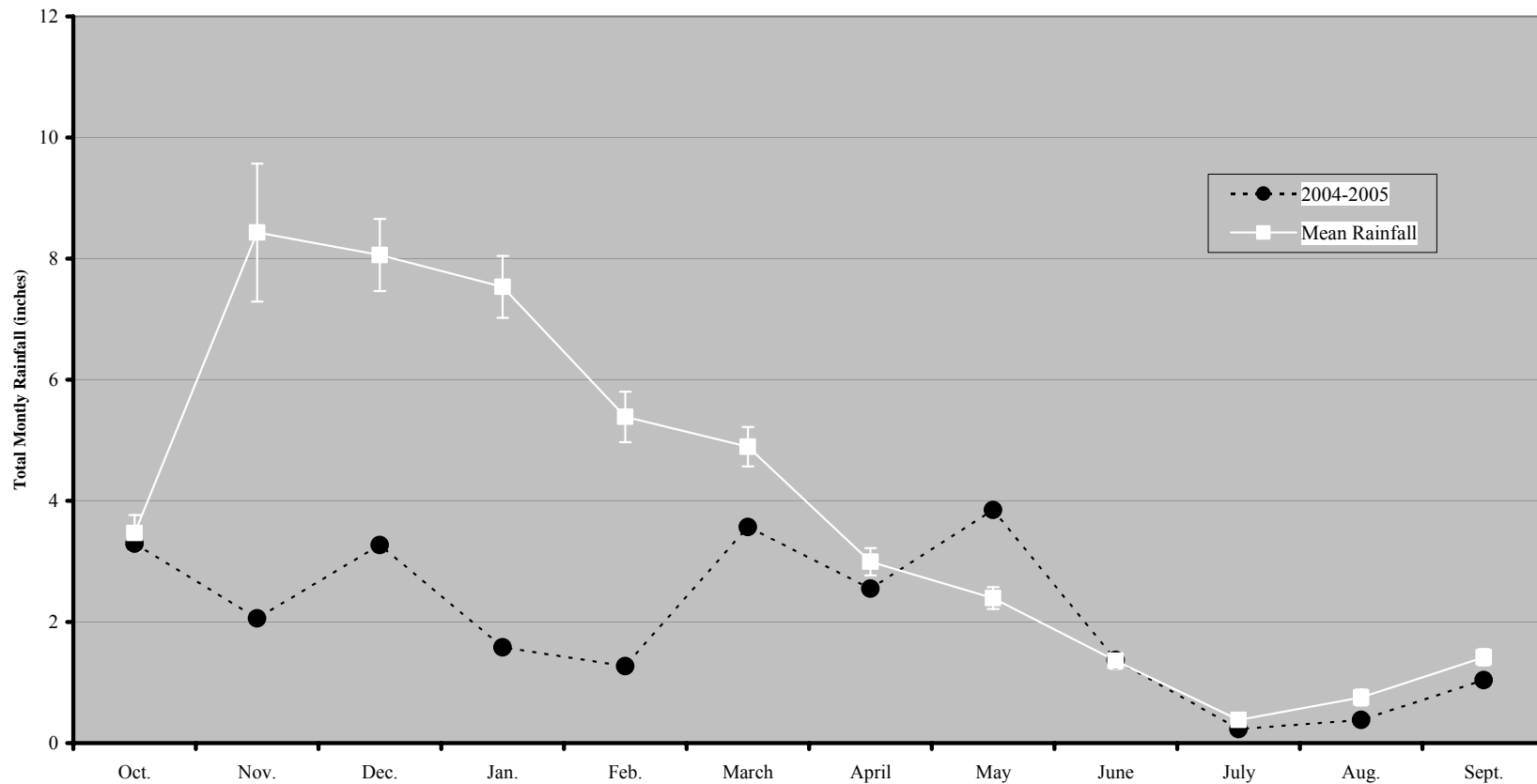
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<i>Scirpus microcarpus</i>	small-fruited bulrush	N															
<i>Scirpus tabernaemontani</i>	softstem bulrush	N													X		
<i>Senecio jacobea</i>	tansy ragwort	I	X	X		X	X		X		X	X				X	X
<i>Senecio sylvaticus</i>	wood groundsel	I															
<i>Senecio vulgaris</i>	old-man-in-the-spring	I															
<i>Sherardia arvensis</i>	blue field-madder	I											X				
<i>Sidalcea campestris</i>	meadow sidalcea	N															
<i>Sidalcea cusickii</i> ssp. <i>purpurea</i>	Cusick's checker-mallow	N									X						
<i>Sidalcea virgata</i>	rose checker-mallow	N															
<i>Sisyrinchium bellum</i>		N											X				
<i>Sisyrinchium californicum</i>	golden-eyed grass	I															
<i>Sisyrinchium hitchcockii</i>	Hitchcock's blue-eyed grass	N	X												X		
<i>Sisyrinchium idahoense</i>	Idaho blue-eyed grass	N	X				X		X		X		X		X		X
<i>Sitanion hystrix</i>	squirrel-tail bottlebrush	N															
<i>Solanum dulcamara</i>	climbing nightshade	I															
<i>Solidago canadensis</i>	Canada goldenrod	N															
<i>Sonchus asper</i>	prickly sow-thistle	I		X								X	X		X	X	X
<i>Sorghum halapense</i>	Johnson grass	I															
<i>Sparganium emersum</i>	simplestem bur-reed	N		X													
<i>Spergula arvensis</i>	stickwort	I		X													
<i>Spergularia rubra</i>	red sandspurry	I															
<i>Spiraea douglasii</i>	Douglas spirea	N	X		X								X	X		X	X
<i>Spiranthes romanoffiana</i>	ladies-tresses	N															
<i>Stellaria media</i>	chickweed	I	X						X								
<i>Symphocarpus albus</i>	common snowberry	N															
<i>Taraxicum officinale</i>	dandelion	I			X		X		X			X	X		X	X	X
<i>Toxicodendron diversiloba</i>	poison oak	N	X									X	X		X		X
<i>Trichostema lanceolatum</i>	vinegar weed	N															
<i>Trifolium dubium</i>	least hop clover	I							X			X	X		X	X	X

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		Phase	1	1	1	1	2	2	3	3	1	1	1	1	1	2	1
		Section	Enhancement	P1	East	West	Sod removal	Solarization	Sod removal	Sod removal	Eastern Ash Swale Enhancement	West Prairie Enhancement	Prairie Enhancement	Emergent Restoration and Enhancement	Restoration	Restoration	
<i>Trifolium hybridum</i>	hybrid clover	I															
<i>Trifolium pratense</i>	red clover	I															X
<i>Trifolium repens</i>	white clover	I		X										X		X	X
<i>Trifolium subterraneum</i>	subterranean clover	I															
<i>Trifolium variegatum</i>	white-tip clover	N															
<i>Triphysaria versicolor ssp. versicolor</i>	johnnytuck	N															X
<i>Triteleia hyacinthina</i>	hyacinth brodiaea	N													X		
<i>Typha latifolia</i>	cat-tail	N	X						X			X		X		X	
<i>Verbascum blattaria</i>	moth mullein	I														X	X
<i>Verbascum thapsus</i>	common mullein	I															
<i>Veronica americana</i>	American speedwell	N			X					X							
<i>Veronica arvensis</i>	wall speedwell	I															
<i>Veronica peregrina</i>	purslane speedwell	N		X	X	X							X			X	X
<i>Veronica scutellata</i>	marsh speedwell	N	X	X	X	X				X	X		X		X	X	X
<i>Viburnum ellipticum</i>	Oregon viburnum	N															
<i>Vicia cracca</i>	bird vetch	I	X		X	X			X		X				X		X
<i>Vicia hirsuta</i>	hairy vetch	I															X
<i>Vicia sativa</i>	common vetch	I	X		X	X					X	X			X		X
<i>Vicia tetrasperma</i>	slender vetch	I	X	X	X	X	X	X	X		X	X	X	X	X	X	X
<i>Vulpia bromoides</i>	barren fescue	I		X				X	X	X					X	X	X
<i>Vulpia myuros</i>	rat-tail fescue	I															
<i>Vulpia sp. (annual)</i>	annual fescue	I														X	
<i>Wyethia angustifolia</i>	narrow-leaf mule's ears	N	X				X		X						X	X	X
<i>Zigadenus venenosus</i>	death camas	N	X														



Appendix C. Monthly rainfall for Eugene Airport during 2004-2005.

Rainfall in the 2004-2005 wet season is compared to the mean (displayed with standard error) monthly rainfall between 1940 and 2005.